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ADVANCED MANAGEMENT

MAY 1955

VOLUME XX NO. 5

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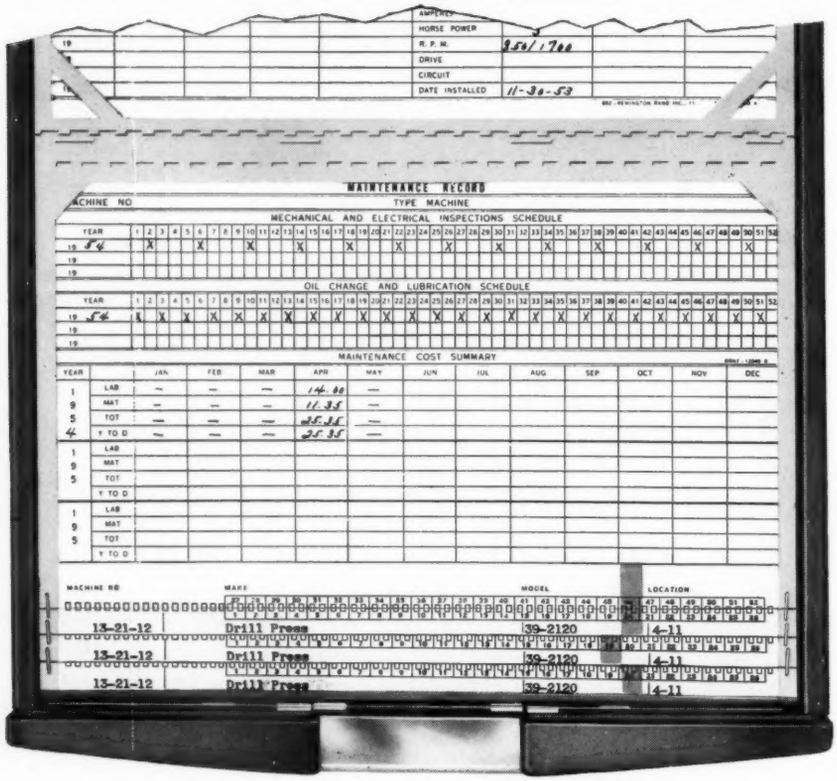

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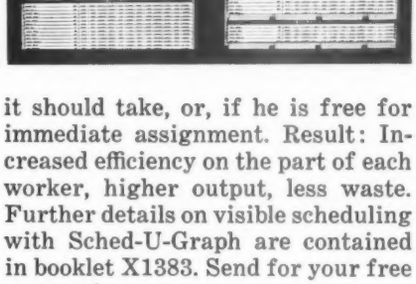

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ADVANCED MANAGEMENT, published monthly by the Society for the Advancement of Management, Inc., 74 Fifth Avenue, New York 11, N. Y., is merged with MODERN MANAGEMENT, and is successor to The Society for the Advancement of Management Journal, the Bulletin of the Taylor Society and of The Society of Industrial Engineers. Re-entered as second-class matter, December 23, 1949, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Copyright, 1955 Society for Advancement of Management. Subscription rate: $8.00 per year. Single copies: 75 cents (members); $1.00 (non-members). An index to ADVANCED MANAGEMENT is published annually, and the contents are also indexed in Industrial Arts Index which is available at Public Libraries. Notification of address changes must be given at least four weeks in advance.

"Through research, discussion, publication, and other appropriate means to conduct and promote scientific study of the principles governing organized effort in industrial and economic life . . . for the general betterment of society . . ."

SAM Constitution

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Harold R. Bixler
Executive Vice President
of Society Operations

HAROLD R. BIXLER has been appointed Executive Vice President of Society Operations of the Society for Advancement of Management. This position replaces and enlarges on the functions of the previous post of Executive Director.

Mr. Bixler has been active in the fields of industrial, business, and community organization work for over twenty-five years through his former positions as Executive Vice President of the Real Estate Board of New York; Executive Vice President of the Bridgeport, Connecticut, Chamber of Commerce; Personnel Director of the Mutual Life Insurance Company of New York, and Assistant Manager of Industrial Relations of the Union Carbide and Carbon Corporation, with specialization in Industrial Engineering, Public Relations, Industrial Relatons, Personnel Administration, and Accident Prevention.

His present and former related activities include: Chairman, New York Personnel Management Association; Chairman, American Society of Safety Engineers; Chairman, Advisory Committee, Commercial Organization Department of the Chamber of Commerce of the United States; Vice Chairman, Faculty Committee, Northeastern Institute, Yale University; Vice Chairman, Employer-Employee Relations Council, Chamber of Commerce of the United States; Personnel Consultant, Life Insurance Office Management Association; Guest Instructor at several colleges and, among other relationships, he is active in the Civic Executives Council and the Trade Association Executives Organizations of New York and New England.

He has been speaker before many engineering, business, and trade association groups, and has been a lecturer at Bullard-Havens Technical College, City College of New York, Columbia University, Harvard University, Johns Hopkins University, Long Island College of Medicine, Newark College of Engineering, New York Academy of Medicine, New York University, New School for Social Research, Pace Institute, Pratt Institute, University of Bridgeport, and Yale University.

Mr. Bixler was graduated from Ohio State University, specializing in industrial management and business administration. He took graduate work at New York University and, among other college activities, was elected to Beta Gamma Sigma Honorary Business Fraternity and Delta Sigma Pi International Professional Commerce Fraternity.

GEORGE B. ESTES, *President*
Society for Advancement of Management

HAROLD F. SMIDDY, Vice President of General Electric and head of that firm's Management Consultant Services Division, is a former Vice President in Charge of Research and Development of SAM. Mr. Smiddy's 34-year business career has included partnership in the well-known management consulting firm of Booz, Allen, Hamilton, and executive service with Electric Bond and Share Company, West Penn Power Company, Ebasco Services, Inc., as well as membership in many leading professional organizations.

Do Industrial Engineers Need Executive Development?

By Harold F. Smiddy
Vice President
General Electric Company
New York City

Men need knowledge of the principles of managing work whether they have chosen a career as an engineer or as a manager. At the least, knowledge of the principles of managing work will help the engineer improve the quality of his specialized efforts. It will also improve his teamwork, because teamwork comes from being able to see your job from the manager's viewpoint in addition to your own viewpoint.

A Business Week article, which was a report on a recent survey made by Moore and Renck at the University of Chicago, was titled "The Engineers' Theme Song Is the Blues." That pretty well describes what the researches found out in their widespread study of professionals in industry.

The situation is indicated to be at that point now where the professional is unhappy and can't say exactly why, and management knows he's unhappy and can't think of exactly what to do. And, to a certain extent, the frustration, which could once be pinned to one situation or another, has now become a general "beef" that's with us like taxes and bills and hurts all day like a tight pair of shoes.

I want to return, after a while, to some of the details of the article on the Chicago studies, because I think we can dig out a few more facts that will help us understand what all of us are faced with and how we can relate it to the question.

Do Industrial Engineers need executive development? Sure they do! And, it's just as sure for those who want to remain as *Individual Professional Contributors* as for those who want to become managers, and we can, in fact, enlarge the scope of the question to even every person who enters industry as a professional worker because they all—whether engineers, accountants or what have you—have the same basic set of problems.

Let's rephrase that question and ask, "Does anybody in industry need executive development?" The answer, as I've said, is "Everybody needs it."

Now, let's ask ourselves another one. "Who is responsible for executive development?" The answer is that, first and foremost, *you* are, and that this responsibility is as much a part of your professional obligation as is your technical ability in your particular kind of work.

The university Industrial Relations Center at Chicago is, according to Business Week, "wrestling with the problem of what industry can do" about the engineers' blues. It might be a good idea for each of us to ask ourselves who, among us, is struggling with what the engineer can do about it, for it is probably still as true as ever that "God helps those who help themselves."

When we speak of executive development, what we really mean is Manager Development. There are two basic kinds of work in any kind of team effort. One, the work of the Individual Contributor, is where results are obtained through the direct application of aptitudes and skills to a particular task. The other, the work of a professional manager, is where the task is to exercise leadership in planning, organizing, integrating, and measuring to set sound objectives and to attain them primarily through the work of others.

All of us, at some stage of our work, have to make a choice between these two kinds of careers, but fortunately it doesn't have to be done at a specific time; and fortunately, also, the decision can be reversed—and often is—if, later, the grass on the other side of the fence seems to be greener. The point, here, however, is that no matter if you do or you don't choose managing as a career, you have to have Manager Education.

The individual contributor needs manager development for at least two reasons. The first is personal, and it has a direct bearing on the way we do our work. The second, while it is personal in the sense that it is an attitude of the individual, is component and company-

wide—even industry-wide—because it bears upon the way in which we do our teamwork.

Managing is accomplishing results primarily through the work of others. There are certain principles of development, however, that each of us can apply to our own job, no matter what we do. This is the purely personal side of manager development; the learning of the tricks of another trade which can be used in your own.

We now know enough, in a measurable and reproducible way, about the work of managing to class its principles as one of the social sciences and the application of these principles as a professional kind of work.

One of the fundamentals, as I have noted, is that the main elements of the work of managing include planning, organizing, integrating, and measuring. These elements of work can, of course, also have real value in other kinds of jobs. I think that all of us who have ever gotten anything at all done in our business life have used such approaches. The trouble is that we often do this intuitively and, therefore, don't always do it well.

Recognizing the existence of scientific principles and knowing that they can be used is no guarantee that we will be able to use them or that we will, in fact, do so in any given situation. Knowing Ohm's Law doesn't mean that we can keep the fuses in the plant's electrical system from blowing out, and knowing that there are ways of systematizing our personal job—whether as a manager or as an individual contributor—is not enough to put system into the doing of it.

What we need to do is to deal with organized and available information about managerial work as another body of knowledge *which can be learned*, just like information about any other skill.

The first reason, then, that the individual contributor needs manager development is that some of the skills which guide the work of the professional manager, can, with little or no modification, also make vast improvements in his own personal performance, providing he knows *what they are* and *how to apply them*.

The "Managerial Attitude"

The second reason an individual contributor needs manager development is that it is the best way he can learn and use what may best be called the "Managerial Attitude." It is best demonstrated by the way we make decisions.

How Do Decisions Affect Work Of Others?

Decision-making is a big and a tough part of work. What to do, how and when to do it, and why bother doing it at all, are decisions that have to be made before the slide-rule is out of its case. They cannot be made in a vacuum because each individual is really doing only part of a total job in a modern industrial setup. There needs to be a realization of how these decisions will affect the work of others and how much the results will contribute to the over-all objectives of the enterprise of which the Individual Contributor's personal job is one component part. This is the initial step in *teamwork*.

There is, therefore, a need present in every job to realize that it has parallel responsibilities. First, there is a functional responsibility which calls for an attitude to be expert and to do your particular assigned task *efficiently*, and *effectively*, and *on time*. It deals, if you are an engineer, primarily with technical problems and calls on your knowledge and skill in the engineering sciences. Second, there is this very big responsibility to integrate activities into the work of the business as a whole. This calls on knowledge and skills in the managing science. It is the relationships, or teamwork, part of over-all "work and teamwork" responsibility.

It requires understanding of the largest possible picture; that is, of why customers, owners, employees, suppliers, and public act the way they do and want what they seem to want. It is understanding the total assembly of the business so that each of its parts can be appreciated not only for themselves but also for how they work together.

There are two ways the individual contributor can get this kind of knowledge. One way is for the Manager to cram it down his throat, but the better way is to go after it voluntarily. The fact of the matter is that each man in an industrial organization has a large "say"—expressed by his own attitudes and actions—in determining the Manager's course. If he has what we may call a "Managerial Attitude"—the ability to see his particular sphere of work and the results of his work as part of the net accomplishment of the team—his manager can lead by persuasion. If he doesn't, he necessarily invites being led by command.

You may be interested in doing a little personal research into this business of "managerial attitude." A great deal has been written about it, and there is really no need for any of us to start our original thinking back with the invention of the wheel. One of the most widely read writers, today, on business in general and managing in particular is Peter Drucker. Here's a sample from his book, *The New Society*, on the subject. He says:

"The demands for a 'managerial attitude' on the part of even the lowliest worker is an innovation. There was neither room nor need for it in the pre-industrial order. It has come into being because mass-production technology depends on social integration. Because of the 'specialization' which makes mass production possible — 'specialization' which . . . is very different from the traditional division of labor—the mass-production technology demands an integration of the individual operation into a unified whole. It is this whole, the team, the pattern, the organization, which produces in the modern industrial system. This 'whole' does not exist in the individual operations themselves. It is a highly abstract thing. But at the same time it is necessary for the function and cohesion of this pattern, that the individual operator see it as a whole and understand his own function with it."

What Happens When "Managerial Attitude" Is Lacking?

What happens when the "managerial attitude" is lacking, when men who are primarily concerned with a particular job in their purely professional life are not given the opportunity, or else haven't developed the attitude, which allows them to view their work in the context of the whole; to sense their relationships as well as their functional responsibility; and to understand that there are both work and teamwork elements required in every job?

Let's go back to the survey made by the University of Chicago people. I want to discuss it a little more because it indicates all too clearly the kind of potential breakdown that has assumed the proportions of a definitely distinct danger in our increasingly complicated industrial world.

I don't want to shift responsibility for

the creation of situations which destroy morale among professional workers. There are inadequate managers and plenty of them, and there likely always will be. Yet, we need to remember that we are looking at the problem here posed of an attitude of the Individual Contributor and not of the manager. The Individual Contributor—has to *help* cure himself of what really amounts to a kind of sickness that has actually put many good men out of action.

Here's one indicator of a lack of "managerial attitude." The report starts by saying:

"The technical experts, engineers, and other professionals in industry seem to be far more frustrated than satisfied. Their dissatisfaction took the form of more than a few pot shots at the management in their replies to the survey, and 'a tendency to strike out almost indiscriminately at all aspects of the work environment.'"

It's significant, I think, that the protests took the form of scattered shot-gun blasts, for it indicates that there was no definite target in terms of specific complaints about working environment or even particularly about pay. It's a case of:

"I do not love thee, Doctor Fell,
The reason why I cannot tell;
But this alone I know full well,
I do not love thee, Doctor Fell."

This part of the "blues" is a clue to what is wrong—there is apparently little understanding of over-all objectives or problems. The report, in fact, is clear on this point, for it says:

Scientists Career-Oriented Not Company-Oriented

"The professional men emerged as job-oriented—concerned primarily with competent performance in the chosen field."

The professional contributors complained bitterly about lack of recognition. Yet many of them—particularly scientists — were frank in stating that they were career-oriented rather than company-oriented, and that they identified themselves with their profession rather than with their company. And they are not alone. Too many managers —and for that matter, too many non-professional individuals also—seem to want to have their cake and eat it too; to enjoy the narrow and specific parts of their personal work and to ignore their dual responsibility to be a citizen of the enterprise, with the duties as well as the privileges of such citizenship.

It seems to me that it is frankly on the selfish side to expect to enjoy the benefits of working as part of a team, and, at the same time, to refuse to shoulder any of the risks or inconveniences which true teamwork entails. Such an attitude would obviously create a situation where even the most finely conceived organization structure and the most dedicated professional managers could not keep the business train steady on the track.

Managerial Attitude Or Personal Interests?

This sort of thing is *within the man.* It needs to be overcome through *individual* effort and through the *self*-development of a mature understanding of the processes of business over and above primary centers of purely personal interest. It is the "managerial attitude" which needs to be acquired.

Finally, in the Business Week report, there is a statement which, matched against Peter Drucker's warning, points out the magnitude of the danger. Drucker's analysis was this:

"The group to whom the 'managerial attitude' is most important is the group that is even more characteristic of the modern enterprise than the mass-production worker: the new industrial middle class of supervisors, technicians, and middle managers. If the efficiency of the enterprise depends on the attitude of the production workers, the very strength and function of the enterprise may well depend on the attainment of a 'managerial attitude' by the middle groups, for these groups are the organization itself, the nerve and circulatory systems of the enterprise."

The University researchers found this:

"The attitude of the professionals is only slightly more favorable than that of production workers and factory labor —about the same as routine office employees. It shows less satisfaction than that of skilled workers, foremen, salesmen, or management."

Taken together, these two statements are the core of the problem. We can see without much trouble that when "managerial attitude" is lacking, we've started to sow the seeds of our industrial destruction, and our industrial destruction would wash individual engineers and their managers down the same drain.

Let's take a look at the other part of the answer to "Does anybody need executive development?" It's pretty obious that if you want to give up working personally as an individual engineer and take a job calling for the work of a Professional Manager, you need to know what a professional manager does. Clearly, the best way that can come about is through orderly and organized Manager Development.

Managing is an occupation that, like engineering, medicine, or law, has at least two essential requirements which it places on the people in it.

First, there is the matter of basic aptitudes—the right kind of emotional, mental, and physical equipment to form a foundation for professional development.

Second, and fully as important, there is the matter of learning the specific skills which give implementation to these aptitudes.

Perhaps we can draw a simple parallel between the professional manager and the professional engineer. The engineer must display certain aptitudes, such as a capacity for problem-solving, a talent for how things fit together, and a "feeling" for materials. He also needs —and this is the important point—a developed skill in arithmetic and algebra, a knowledge of what can be done by fitting things together, and an educated understanding of the strength and other physical properties of materials.

In a similar way, the manager must have, along with the innate ability to "get along with people," some education in the methods by which objectives are matched to possibilities; plans are made; resources are organized; men, materials, markets, and plants are integrated; and results are measured. These, like mathematics and mechanics, are the skills of the professional, and they, too, *can be learned.*

Hence, let's answer the question "Do executives need executive development?" by saying, "If anybody does, yes, they do!"

Where Should Executive Development Begin?

Although we have answered our question, we haven't as yet given it practical meaning. Where should manager education and manager development begin, and what can we in industry do to make it a reality?

Fundamentally, it seems clear that

there is plain need to begin at least elementary—yet very specific—"manager education" in the colleges and graduate schools of our universities. Is it not directly possible that much of the dissatisfaction which the University of Chicago study brought to light resulted from the overly refined and specialized curriculums our professional schools have adopted? Has not many a man who bought an "engineering education" found out too late that he bought a pig in a poke, and that some of the important pork was not in his bag?

We tend to become, too often and too easily, I think, experts who are not really expert in *every* phase of our work. Then, too, we're often unsuccessful in trying to cover up the voids in what we know with the thin cloth of our *technical skills*. As one of our General Electric men put it, "Every man is on guard to keep his boss from finding out what he ain't."

Knowledge Of Special Skills Easier To Get Than Teamwork

As we have seen, there is a need for teamwork as well as for technical or functional work in every kind of personal job. Unless somewhere along the line, we were educated to look at our own work within the circle of the common objectives, common interests, and common purposes of our business—and, indeed, to look at our business within the far larger boundaries of the common good of all people—I submit that we are not, in the true and practical meaning of the word, professional "anythings."

I haven't made all this up, nor am I trying to get unduly "theoretical" with you. It's a fact that industry is turning to the once neglected Bachelors of Arts for a fair portion of professional people. In the last several years over 40 per cent of the college graduates my own company has recruited have been liberal arts men. It seems that it is often as easy, or easier, to develop the *special skills* of the functional side of our work than it is to develop the broad understanding of social philosophies that making worthwhile business contributions requires in people with excessively narrow technical training. This is not theory or threat. It is hard fact. And it poses the question bluntly to all of us—in business and in college administration alike—whether the fundamentals of "teamwork," of "managerial attitude," and of "manager development" do not need increasingly to be implanted at the undergraduate level before the man takes his first full-time business job at all.

Perhaps, then, we should re-evaluate our professional education techniques: less of physics and more of people, less of steam tables and more about dinner tables. It may, at least, be the *proper* beginning of manager development—which our analysis shows, in the final sense, is *self*-development.

What Can Industry Do?

Revamping and revitalizing our college curriculums, in any event, is in the future.

But we—you and I who are the present human resources of industry—are in the here-and-now. What then can each of us do within the framework of our particular business, and with the tools available to us, to stimulate better development of managers and of the "managerial attitude"?

Too many traditional ways were based on the development of "crown princes"; or were simply a catch - as - catch - can scramble for survival, or a casual carbon copy of the way our own boss acted.

The record shows that such approaches have failed to develop men of the quality and in the quantity remotely approaching the needs of today's and tomorrow's complex industrial society. We did, and do, have managers, of course, but they were, and are, frequently too little in number, too late in the assumption of responsibility, and sometimes less than they might be in the full realization of their potential.

Beginning with the turn of the century, students of industrial organization began to investigate and define the nature of the manager's work in the modern, diversified, technological enterprise. Consequently, we stand now, some fifty years later, with a considerable grip not only on its nature, but also and even more significantly, on the principles which are the sound foundations for defining and performing the distinct work of the manager in a truly professional way.

It is possible for you, as a part of industry, to contribute to the development of executive attitudes in two ways. First, there is personal *self-development*, for, no matter where we happen to stand on the chart of organization, each of us, alone, is *responsible* for learning all the skills we need. This isn't the kind of job you can set aside either. While you worked, ate, or slept, the world you knew made some changes, and the successful man needs to race and walk to keep up with them. It's a challenge which gets bigger as we come to know more about it.

Second, there is a responsibility for guiding, counseling, and teaching those with whom we work. This, though it is a major concern of the Professional Manager, is, in very large measure, a common responsibility of the Individual Contributor, and, indeed, of any man who considers himself a professional.

Self-Development Thrives On Good Teaching

Teaching, which is the communication of expert knowledge and creative ideas, is essential if people are going to be given the opportunity for self-development. Otherwise, education descends to the level of swapping the same old ideas back and forth. It was pretty well proved, according to the old story, that the best the people on the Isle of Man could do was to eke out a meager existence by "taking in each other's wash." Our self-development efforts need to be stimulated by the addition of new concepts, and it is the responsibility of all of us to tell what we know as fast as we are sure it is right and that we have

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		Non-Resident	78

MOVING?

Don't forget to send us your new address.

learned it soundly, and to keep on learning as fast as we can.

In my own company, General Electric, we embarked some years ago on an intensive study of the development of men, and in the past year we have been able to bring what we learned to the level of use in the sense of making definite improvements in our previous development approaches. We are increasingly making the climate of work right for the better self-development of managers who will manage and of individual contributors who understand the need for and meaning of the "managerial attitude" in functional no less than in managerial jobs. There are many who are doing similar work—the American Telephone and Telegraph Company, General Motors, Sears-Roebuck, International Business Machines, and countless smaller companies whose men are eagerly swapping ideas and developing themselves actively through the organized programs of SAM and our other effective management associations.

Everybody Needs Executive Development!

Thus, though our techniques may be somewhat different in our particular company environments, our realization of the need for such work and of the objectives of it are increasingly common property—and this is good! I strongly feel that if the same spirit were more rampant in more of the other countries, the outlook for world trade and even for world Peace would be immeasurably brighter.

I cannot, in this limited space, attempt to tell you what we or other companies are doing, and I doubt whether such specific information is a proper subject. We are seeking the answer to a basic question, and I hope that in this space, we have found it.

Does everybody in industry need executive development? Let's say that everybody who is or wants to be *anybody* in our expanding future, *must* have it.

END

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GIFFORD H. SYMONDS has been employed by Esso Standard Oil Company for the past 26 years. In 1933 he helped organize one of the first refinery technical groups at Esso's Central Process Control Group, responsible for Operations Analysis activities. During World War II he directed the activities of Aviation Gasoline Advisory Committee of P.A.W. in providing feed supplies for industry's aviation gasoline plants. During the past three years he has promoted the application of the methods of Operations Research to the study of refinery operations, through the M.T.C., of which he is Chairman of the Subgroup on Operations Research. Mr. Symonds heads Esso's Central Operations Research Project. He has written a collection of studies entitled "Linear Programming in the Solution of Refinery Problems", which will be published in the near future.

Mathematical Programming As An Aid To Decision Making

By Gifford H. Symonds
Chairman, Operations Research Sub-group
Esso Standard Oil Company
Linden, New Jersey

The scientific method has received much homage because of its singular effectiveness in helping man to use his environment more efficiently. Now industry is gradually solving some of its more costly problems by adapting the analytic and mathematical techniques of established science. This article examines some of the basic techniques of science and illustrates how they are being applied in industry.

THE APPROACH OF OPERATIONS RESEARCH

"OPERATIONS RESEARCH" deals with the application of scientific methods to current operations, or to current planning of future operations. We would like to apply scientific methods to our day-to-day activity much the same as we have applied scientific methods to our future activity with discovery, understanding and development.

There are three things involved in the approach of Operations Research—the problem, the objective and the solution.

The first question to ask, of course, is whether there is a worthwhile problem involving a major decision. Is it necessary to use the scientific method? There are several varieties of scientific method but all of them are concerned with understanding.

The second point to take up is the question of a realistic measure of effectiveness. This may be something like cents per gallon or dollars per day or some other expression. It must be something definite so that it can be expressed mathematically. It cannot be vague or hazy. We cannot say that our objective is to make the maximum production of the highest quality at the minimum cost. Such a thing would be hard to express and still harder to obtain.

The third point is the method of applying operations research techniques. The method is to develop a model of the operation, to study this model and to determine the best operation. Figure 1 shows a diagram of an operation together with a mathematical model.

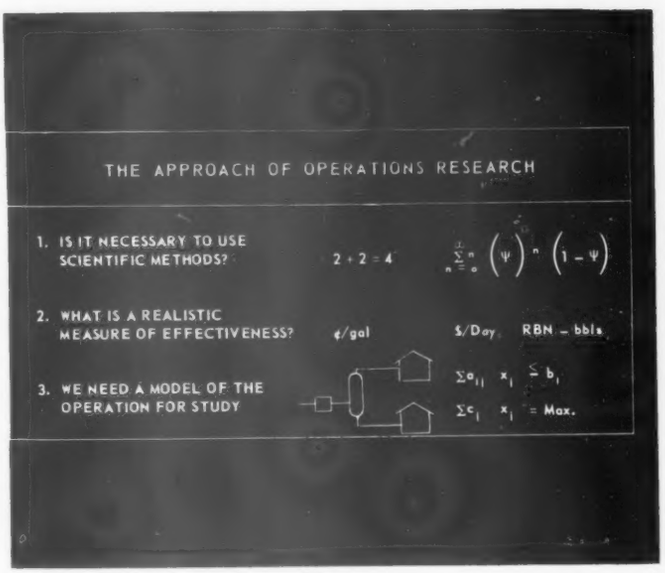

THE APPROACH OF OPERATIONS RESEARCH
1. IS IT NECESSARY TO USE SCIENTIFIC METHODS?
2 + 2 = 4
2. WHAT IS A REALISTIC MEASURE OF EFFECTIVENESS?
¢/gal
$/Day
RBN – bbls
3. WE NEED A MODEL OF THE OPERATION FOR STUDY
Max.

Fig. 1

Figure 2 (next page) depicts a business dealing with nuts which will illustrate in very simplified form an application of the method of Linear Programming. The problem here is to decide whether to sell peanuts or cashews and if so, how much of each. The measure of effectiveness in this problem is going to be our profit in dollars per day which we want to maximize. Figure 2 shows the amount of peanuts we will sell plotted against the amount of cashews we will sell. We

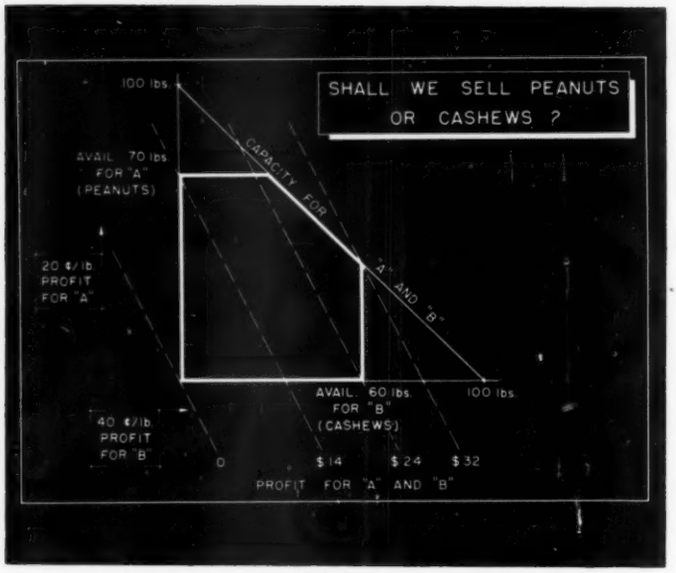
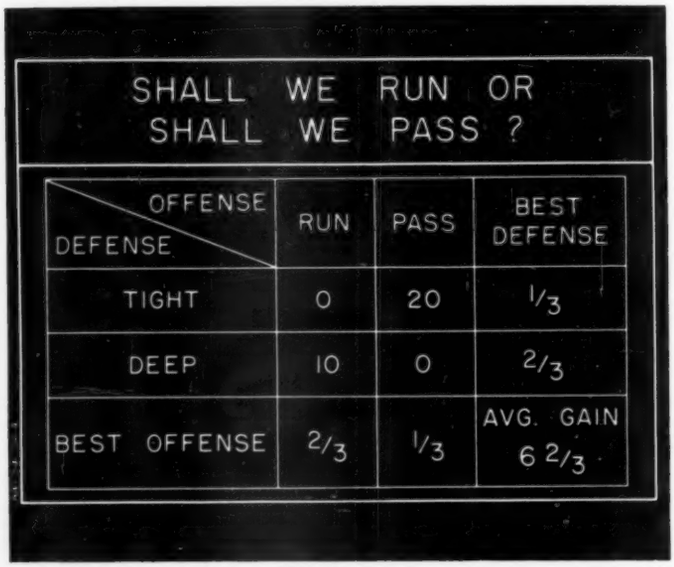


Fig. 2

have available 70 lbs. of peanuts, 60 lbs. of cashews, and we also have a capacity limitation in our operation of 100 lbs. of either peanuts or cashews. In addition, we cannot sell negative peanuts or negative cashews. We have now defined the limits of this operation by the heavy outline in Figure 2. This gives us an area of operation, the boundary of which we call a set of linear constraints.

Now we have our independent objective function which we want to maximize shown in Figure 2 by the dashed lines. This simply shows that we get 20c a lb. profit for peanuts and 40¢ a lb. profit for cashews and each dashed line is for a constant $/day profit. It will be noticed that these lines have been placed in such position that the extreme line for the maximum profit just intersects the edge of the heavy bounded area of constraints. This point, then, is the solution to this problem which can also be obtained mathematically. This is a very simple problem and when there are many variables it is not possible to draw a picture but the problem can be solved by mathematics to obtain an answer just as surely.

Another method of Operations Research is the Game Theory, sometimes called the Theory of Competition. The



DEFENSE \ OFFENSE	RUN	PASS	BEST DEFENSE
TIGHT	0	20	1/3
DEEP	10	0	2/3
BEST OFFENSE	2/3	1/3	AVG. GAIN 6 2/3

Fig. 3

illustration in Figure 3 concerns the decisions required in a football game. As shown, the offensive team can either run or pass and the defensive team may have a tight defense or a deep defense. If the offense decides to run every play, the defense, of course, will have a tight formation and there will be no gain. If the offense decides to pass on every play, the defense will have a deep formation and again there will be no gain. This teaches us the first thing that practically every quarterback knows, namely that you have to mix up the play, employ what we call a mixed strategy.

The problem can be solved mathematically with a unique answer showing that for this particular set of conditions, the offensive team should run two-thirds of its plays and pass one-third of its plays and the defensive team should use a deep defense two-thirds of the time and a tight defense one-third of the time. The average gain per play will be 6-2/3's yards. If either team attempts to use any other combination of plays, the other team could take better advantage of it. This is a so-called minimax solution.

Figure 4 shows another technique of Operations Research

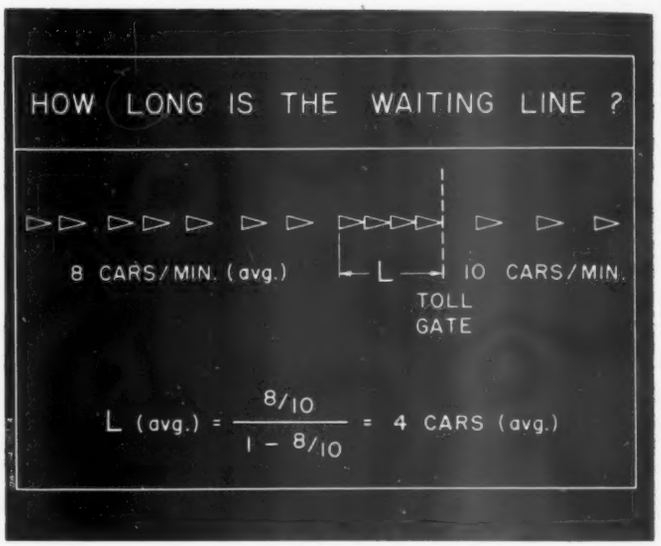


Fig. 4

called the Waiting Line Theory. A simple problem shows a toll gate which releases cars at a constant rate of ten cars per minute, with cars arriving at an average rate of eight cars per minute. How long is the average waiting line? In this particular case, the problem is very simple and can be solved with a very simple formula giving the answer of four cars. Some people might say "Well if the cars are going through faster than they're coming in, why should there be any line?" The answer is that sometimes there isn't any line. Sometimes, however, the line has one car, two cars, four, six or eight cars and the proportion of time when there are various numbers of cars can be determined by this mathematical model. This is important in such things for example as docking ships or repairing equipment with a breakdown at a random rate.

Now with this brief look at the methods of Operations Research, it is important to consider next how to put these tools to work. Figure 5 (next page) shows a workable scheme. This plan is based largely on experiences in war time and post war operations research. It seems to be agreed that the most important method is what is called a Team Approach, with an Operations Research Team created to study a given project. This Operations Research Team apparently

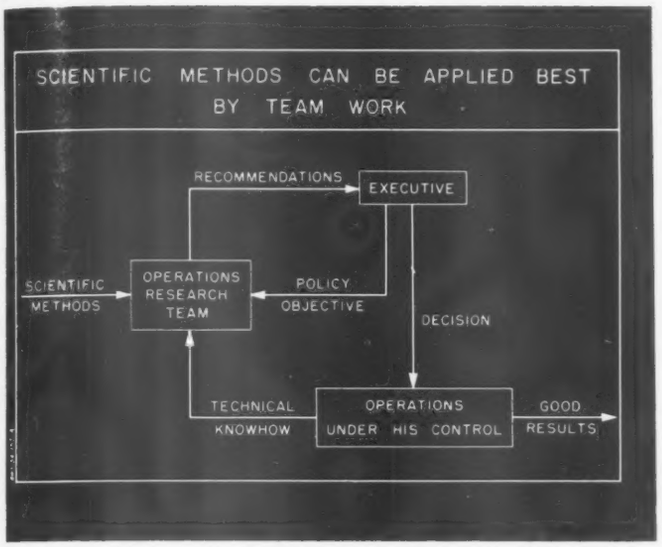


Fig. 5

must consist of people who have technical know-how, scientific knowledge and policy guidance. A true research group is not concerned with the execution of any recommended results but only with drawing correct conclusions and possibly making recommendations.

The bounded area of the research problem cannot exceed the scope of the executive for whom the study is made. However, true optimization can be obtained only by considering the entire operation. This suggests that the Operations Research Team should be placed high in any organization. It may be desirable to have Operations Research projects at various levels in an organization, depending upon the needs for improvement. Thus one may have a plant level production scheduling problem, a department level sales improvement problem and a Company level business expansion problem. The research workers at any level require freedom of thought, freedom of communication and information and freedom of time in order to apply scientific methods to understanding and improvement of operations.

REFINERY FUEL OIL BLENDING PROBLEM

The problem of blending specification fuel oil from pitch is a typical refinery problem which can be solved by the method of Linear Programming. In Figure 6, there is shown a simplified version of this problem. With an availability of 1,000 g/h of pitch, this material may be blended with flux

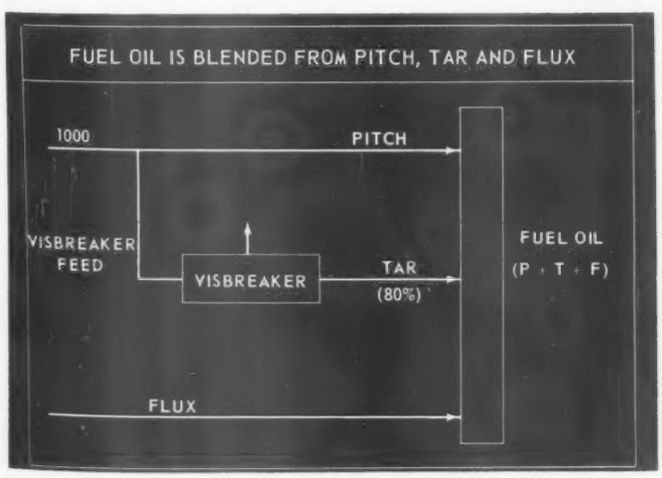


Fig. 6

stock to meet the viscosity and gravity specifications and sold as fuel oil or it may in part or in whole be sent to a visbreaker where a yield of 80% of tar is obtained. The tar may then be blended with flux stock to make specification fuel oil.

Figure 7 shows the relations which convert gravity and viscosity readings to gravity blending numbers and viscosity blending numbers which will blend linearly. It is noted that the pitch and tar have lower gravities and higher viscosities than fuel oil and require the addition of flux to meet the specification limits.

In Figure 8 are shown the equations which are pertinent to the fuel oil blending problem. The viscosity and gravity requirements are stated as inequations to permit the prod-

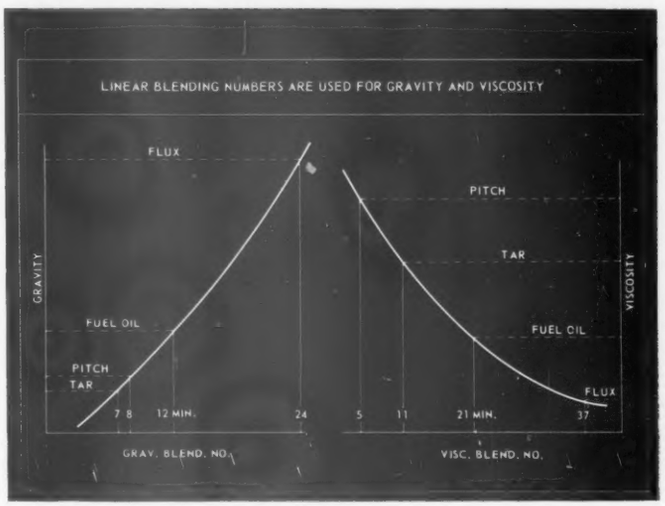


Fig. 7

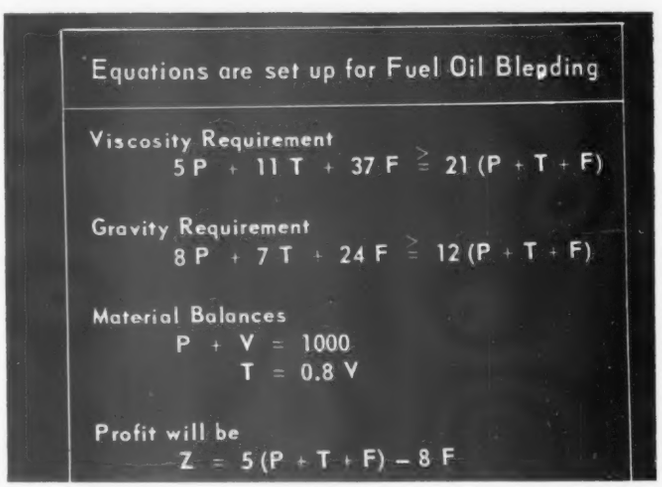

Equations are set up for Fuel Oil Blending
Viscosity Requirement
5 P + 11 T + 37 F ≧ 21 (P + T + F)
Gravity Requirement
8 P + 7 T + 24 F ≧ 12 (P + T + F)
Material Balances
P + V = 1000
T = 0.8 V
Profit will be
Z = 5 (P + T + F) – 8 F

Fig. 8

uct to be blended above viscosity or gravity specifications if this should prove to be desirable. The material balance equations correspond with the availability of stock and the yield in the visbreaking operation. The function to be maximized is the gross receipt for fuel oil blended less the cost of the flux stock. In this case, it is assumed that the pitch or the tar would have no value unless blended to commercial fuel oil. It can be seen that this function would tend to blend all of the pitch and tar into the fuel oil and to minimize the amount of flux stock required. Figure 9 (next page) shows the formulation of fuel oil blending for solution by Linear Programming. The inequalities shown above have been converted to equations by use of the giveaway factors

The Basic Case involves maximum giveaway

	P	V	F	X_1	X_2	X_3	Q
← X_1	2	1	−2	1			0
X_2	1	1	−3		1		0
X_3	1	1				1	1000
Z	−5	−4	3				0

Fig. 9

X_1, X_2 and X_3. The first two rows have been scaled for simplicity. In this basic case, neither the pitch nor the tar from visbreaking is utilized and X_3, the giveaway in the availability of pitch, is set equal to 1,000 g/h. Under these conditions, no fuel oil is blended and no flux is used. The profit in the operation is zero. This is known as the "null" or "do nothing" case and is the usual starting point for improving the solution to maximize the objective. In the Z row of the table, the negative elements indicate the potential profit in ¢/gal. for using the material indicated by the column. Thus each gallon of pitch blended into fuel oil would increase the profit by 5¢ and each gallon of pitch sent to the visbreaker would increase the profit by 4¢. The method of Linear Programming converts the basic case into a succession of feasible solutions each attempting to take advantage of the potential profit in the preceding case.

Figure 10 shows the final case which was obtained by the Linear Programming method. In this case, the amount of pitch sent to visbreaking is 1,000 g/h or all of the available pitch. No pitch is sent directly to fuel oil blending, the amount of flux stock is shown as 500 g/h, the viscosity requirement is exactly met but the gravity giveaway shown as X_2 amounts to 500 which when rescaled is 20/13 units per bbl. The profit is shown to be 2500¢/hr. The profit would be decreased by ½¢ per gallon for every gallon of pitch diverted from visbreaking and blended directly into fuel shown by the Z element in the P column. Profit could be increased by 3/2¢/gal. by relaxing one unit on the viscosity specification (X_1). Profit could also be increased by

The Final Case brings V into the basis and removes P

	P	V	F	X_1	X_2	X_3	Q
V	1	1				1	1000
X_2	$-3/2$			$-3/2$	1	$1/2$	500
F	$-1/2$		1	$-1/2$		$1/2$	500
Z	$1/2$			$3/2$		$5/2$	2500

Fig. 10

5/2¢/gal. for every gallon of additional available pitch (X_3).

Figure 11 shows the final case indicating the disposition of the available pitch resulting in 1,300 g/h of commercial fuel oil product with the viscosity balance at the specification, the gravity balance showing 1½ units giveaway and the optimal profit of 2,500¢/hr. for the operation.

REFINERY IMPROVEMENT PROGRAM PROBLEM

A typical refinery improvement program problem under competitive conditions can be set up and solved by the game theoretic method.

Figure 12 shows pictorially that two refineries share a fixed market but are not in balance with demand. This

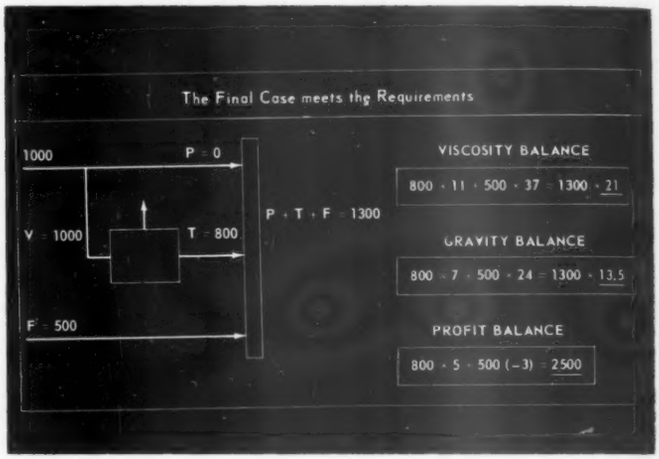

The Final Case meets the Requirements
1000
P = 0
V = 1000
T = 800
F = 500
P + T + F = 1300
VISCOSITY BALANCE
800 · 11 + 500 · 37 = 1300 · 21
GRAVITY BALANCE
800 · 7 + 500 · 24 = 1300 · 13.5
PROFIT BALANCE
800 · 5 + 500 (−3) = 2500

Fig. 11

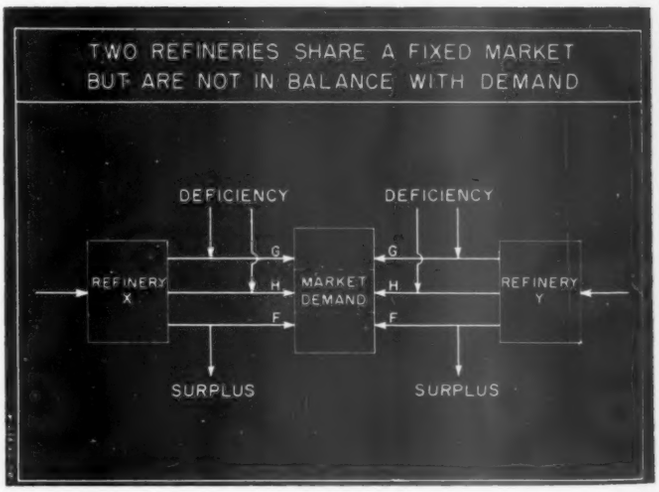


Fig. 12

situation is not uncommon since refineries are usually set up to manufacture economically a limited range of products in accordance with product demands when the refinery was built. The market demands can change appreciably in time, for example the change of railroad locomotives from fuel burning steam engines to modern Diesel engines will have a considerable effect upon the demand of products from the refineries, creating surpluses of some products and deficiencies of others. These surpluses and deficiencies can be corrected by transportation of products between the refinery and other marketing areas at some transportation disadvantage. It becomes economical in such a situation to modernize the refinery in accordance with the new market demands.

Figure 13 shows a number of alternate projects for modernizing a refinery to improve its profit situation. Each of these projects will result in the profit shown, provided the specific yields produced are in accord with the market demand.

Since a competitive refinery Y is also faced with a modernization program, it is obvious that the improvement in one refinery will have a bearing on the profit situation at the other. In the absence of direct collusion, this situation gives rise to formulation of the problem as a two-player zero sum game of strategy.

Figure 14 shows the specific profit to refinery X, depending upon the modernization program at X and the modernization program selected at refinery Y. Thus refinery X can

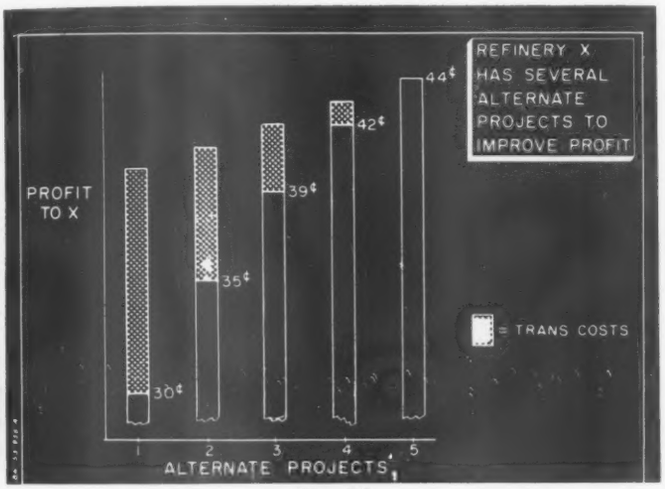


Fig. 13

Profit to X Depends Upon Both X and Y Strategies

	X_1	X_2	X_3	X_4	X_5
Y_1	30	35	39	42	44
Y_2	34	38	41	43	42
Y_3	37	40	42	41	39
Y_4	39	41	40	38	35
Y_5	40	39	37	34	30

Fig. 14

improve its profit from 30 to 44¢/bbl. by adopting plan X_5 if refinery Y does nothing, but if refinery Y adopts plan Y_5 while X adopts X_5, the refineries would be seriously out of balance with product demand in an opposite direction and the profit to X would thereby be decreased to 30¢/bbl. In the formulation of this problem for solution by the game theoretic method, Figure 15 shows the problem set up for solution. The specific profits for the twenty-five combinations of X and Y have been scaled for convenience in computation by subtracting 29 from each element. The solution of this problem is shown in Figure 16 where the optimal profit for X is 37.66¢/bbl. when adopting modernization plan X_2 for one-third of its crude run and plan X_3 for two-thirds of its crude run.

The Problem Matrix is Obtained from the Profit Table.

	X_0	X_1	X_2	X_3	X_4	X_5	Y_1	Y_2	Y_3	Y_4	Y_5
(Y_1)	1	1	6	10	13	15	−1				
(Y_2)	1	5	9	12	14	13		−1			
(Y_3)	1	8	11	13	12	10			−1		
(Y_4)	1	10	12	11	9	6				−1	
(Y_5)	1	11	10	8	5	1					−1

Fig. 15

Under these conditions, the best responding strategies of Y would be to adopt plan Y_1 for one-third of its crude run and plan Y_5 for two-thirds of its crude run. The mathematical solution obtained will be exact for the conditions which are built into the problem. It is obvious, of course, that if some of the facts shown in the problem setup are not realities, but only probabilities, then the solution itself will become only a probability. It is also true that the problem may not take account of certain features which have not been expressed mathematically. Thus for example a modernization program may not only correct the maldistribution of products but may also make it possible to improve the product quality and this may have an effect upon the market share of each refinery. Where such conditions can be expressed mathematically, they can, of course, be built into the problem. In any event, it is felt that the mathematical solution should be of valuable assistance to the executives who are responsible for making decisions concerning future planning at their plants.

PROBLEM OF THE PRODUCTION AND INVENTORY REQUIREMENTS OF A SEASONAL PRODUCT

A typical problem concerning the production and inventory requirements of a seasonal product may be solved by the constrained game theoretic method. Figure 17 shows the cumulative production and the cumulative demand of the seasonal product of heating fuel plotted against time in a typical year. The winter period is divided into two parts, period A for the first half of the winter and period B for

The Optimal Profit is 37.66¢/b

	X_0 ----- Y_1 ----- Y_5			ΣY
X_2	0.0385	0.1535	−0.1920	−0.0385
X_3	0.0770	−0.1920	0.1150	−0.0770
Y_2	0.269	−0.923	−0.347	
Y_3	0.423	−0.807	−0.616	
Y_4	0.308	−0.270	−1.039	
ΣX	0.1155	−0.0385	−0.0770	−0.1195

with:

$x_2 = 33.3\%$,

$x_3 = 66.7\%$,

$Y_1 = 33.3\%$ and

$Y_5 = 66.7\%$

$$\pi = \frac{1}{0.1155} = 8.66$$

Profit = 29 + 8.66 = 37.66

Fig. 16

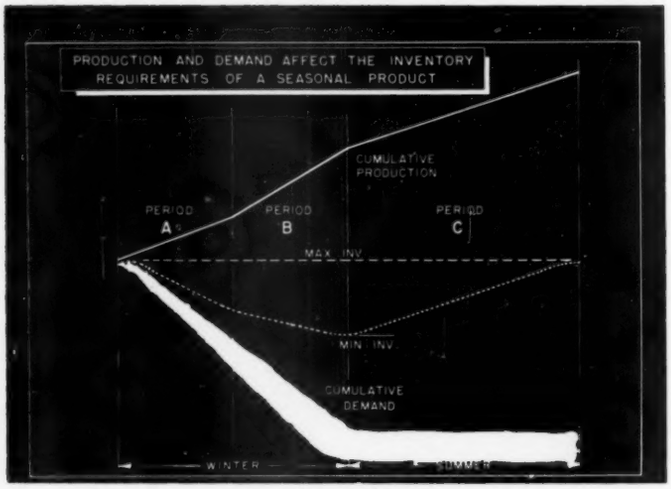


Fig. 17

the second half of the winter. The summer period is designated as period C. Starting at the beginning of the winter period with the maximum inventory, the demand is fairly high, thus drawing on the inventory in addition to the production scheduled during periods A and B until the inventory reaches a minimum value at the end of the winter and then the production during the summer period C is required to restore the inventory to its maximum position at the beginning of the winter period again. This problem is difficult mainly because of the highly variable demand in the heating fuel requirements during the winter periods.

Figure 18 shows a record of the variability in the heating fuel requirements, stated as half-season requirements, showing an almost normal distribution curve with the maximum requirement at a value of about 22.5.

Figure 19 shows the economic data required in this study. The unit cost of production is at a minimum at the average production rate and rises appreciably at higher and lower rates of production. With abnormal demand, there is also some effect on the price of heating fuel. The unit cost of maximum inventory associated with tankage requirement and the unit cost of average inventory (tied-up working capital) are constants at any production rate.

Figure 20 shows the limiting probabilities which can be

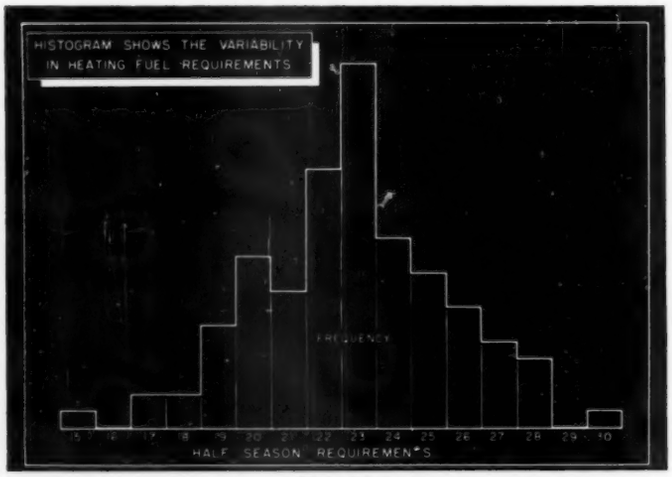


Fig. 18

placed on nature's strategies affecting the product requirements. Thus the average half-season requirement is 22.5 but there is a probability that the requirement will be over 25.5 not more than 25% of the time and over 28.5 not more than 5% of the time. The constrained game method will select sales requirements as limited by these probabilities in an attempt to minimize the refiner's profit in this business. The refiner's strategy will be selected under such conditions of adversity to maximize refiner's profit.

Figure 21 shows the method of building up the profit for each combination of refiner's strategy and nature's

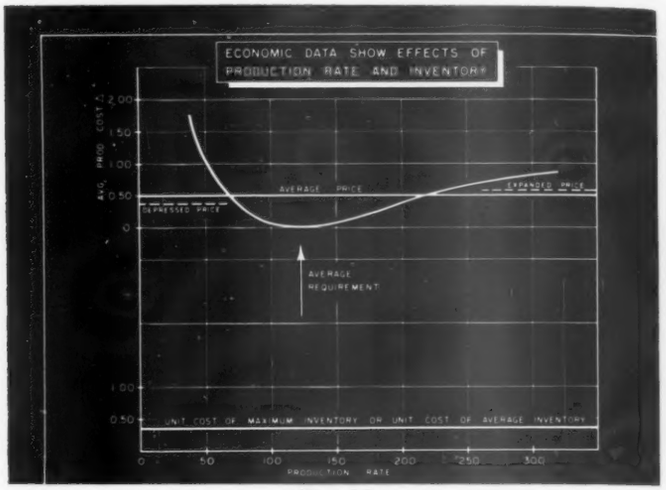

ECONOMIC DATA SHOW EFFECTS OF PRODUCTION RATE AND INVENTORY
AVG. PROD. COST $
AVERAGE PRICE
EXPANDED PRICE
DEPRESSED PRICE
AVERAGE REQUIREMENT
UNIT COST OF MAXIMUM INVENTORY OR UNIT COST OF AVERAGE INVENTORY
PRODUCTION RATE

Fig. 19

strategy. Each refinery strategy is given as a combination of the maximum inventory available and the production during period A, consisting in this example of 24 and 10.5. Nature's strategy is shown as specific requirements for periods A and B, in this case 16.5 and 22.5. Inventory #2 (between periods A and B) would be 18, the possible requirement for period B shown by the histogram would be 28.5. To protect against this requirement, it is necessary to produce 10.5 in period B. This results in a carryover of 6 in inventory #3 (between periods B and C) and requires a production in period C of 18. The costs associated with productions and inventories and, in this case, a price adjustment for low requirement result in a specific profit of

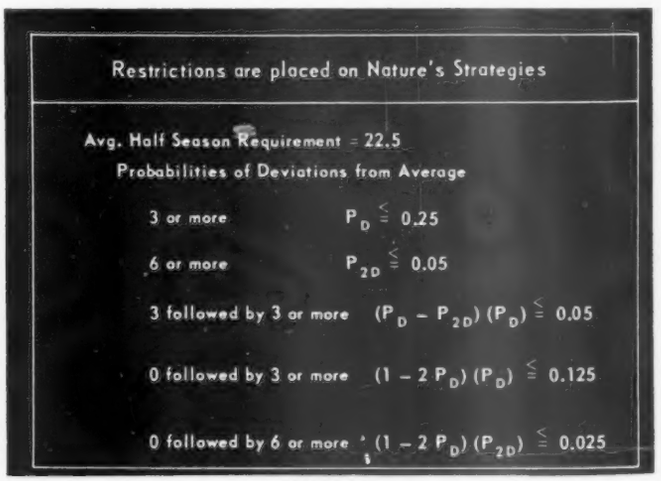

Restrictions are placed on Nature's Strategies
Avg. Half Season Requirement = 22.5
Probabilities of Deviations from Average
3 or more $P_D \leq 0.25$
6 or more $P_{2D} \leq 0.05$
3 followed by 3 or more $(P_D - P_{2D})(P_D) \leq 0.05$
0 followed by 3 or more $(1 - 2P_D)(P_D) \leq 0.125$
0 followed by 6 or more $(1 - 2P_D)(P_{2D}) \leq 0.025$

Fig. 20

—0.97 for this combination of strategies. The complete profit table consists of 6 alternate refinery strategies and 13 strategies of nature.

Figure 22 shows the solution of this problem by the game theoretic method indicating that refinery strategy P_{16} with a maximum inventory of 27 and production in period A of 10.5 has the highest profit of 3.786. The profit associated

with each of the other refinery strategies is listed in the table. It is interesting to note that refinery strategy P_{14} with a relatively small difference in the maximum inventory shows the lowest profit.

Once again it must be emphasized that this solution will be exact only for the facts that are built into the problem. However, the executive responsible for decisions concerning the method of planning this heating fuel business could be guided by these mathematical results in addition to his intuitive judgment. The constrained game method will result in a conservative answer to this problem since the refinery strategies are selected in response to those strategies of nature which tend to minimize the profit. It is believed that this is the most satisfactory method for planning operations with an appreciable risk factor. END

The Payoff Matrix is based upon Production Rates which protect requirements

EXAMPLE		Quantity	Cost
Refinery Strategy P_{14}	Max. Inv.	24	8.64
	Prod. A	10.5	0.13
Nature's Strategy P_{20}	Requir. A	16.5	
	Requir. B	22.5	
	Inven. 2	18	
	Poss. Requir.	28.5	
	Prod. B	10.5	0.13
	Inven. 3	6	
	Prod. C	18	1.67
	Avg. Inv.	15	5.40
	Total Production	39	15.97
	Realization	39	19.50
	Price Adj.	22.5	−4.50
	Profit		−0.97

Fig. 21

Solution shows the Best Inventory and Production Rate

Refinery Strategy	Inven. 1	Prod. A	Probable Profit
P_{16}	27	10.5	3.786 − 0 = 3.786
P_{17}	27	13.5	3.786 − 0.164 = 3.622
P_{18}	30	10.5	3.786 − 0.252 = 3.534
P_{15}	24	13.5	3.786 − 0.965 = 2.821
P_{19}	30	13.5	3.786 − 1.822 = 1.964
P_{14}	24	10.5	3.786 − 2.919 = 0.867

Fig. 22

The Essence of Good Job Supervision

IN APPROACHING the question: What is good supervision of young workers? the Committee recognized that basic principles of good supervision have been developed which are generally applicable to all workers, and that it was the task of the Committee to examine their significance as a base for special attention to young workers. Realizing that two days of discussion were insufficient to examine in detail these principles as they might be adapted to young workers, the Committee framed the following statement of the essence of good supervision for workers generally, with special help from one of its members, Dr. Gilbert David:

> What is the kind of supervision that leads to the greatest job satisfaction and the best work performance? In essence, good job supervision means dealing effectively with people. To do this a supervisor must first of all understand the psychology of his employees—what motivates them, what gives them satisfaction, what causes resentment and resistance, what leads to frustration and to a sense of failure.
>
> But understanding of these things is only the first step. Knowledge is not enough—the knowledge must be operating at all times. One of the most valuable assets of the good supervisor is an ever-alert sensitivity to the needs of his workers. Show me a good supervisor, and he will be one who recognizes quickly the human problems of his workers, and who has the skill to deal with them constructively. He is a man who genuinely likes his people, and enjoys working with them. The good supervisor, you point out to me, will be a man who realizes that he will not be able to accomplish his objectives by tight control and close direction for he knows that such supervision is an affront to maturity. He knows it will serve to either antagonize his workers or eventually render them passive conformists lacking initiative.
>
> Rather, that good supervisor of yours will know that he can develop a cooperative work team by integrating the thoughts and efforts of his people. He does this by working with them, not over them; getting them to share in the decisions which are necessary for their day-to-day activities. In this way, he will tell you, he benefits from the experience of the people who actually do the work. Further, he knows that people get satisfaction from being given the opportunity to get their own ideas put into practice; he has learned long ago that people will support the ideas of their own making, and will do their best to carry them out successfully.
>
> The Committee believed that this basic attitude of understanding and respect for the integrity of individuals is the key to effective treatment not only of adults but also of young workers who come to industry for their early work experience. *From JOB SUPERVISION OF YOUNG WORKERS, Published April 1953 by U. S. Department of Labor.*

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3. Engineering Applications

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A New Focus In Executive Training

By

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Clovis Shepherd, *M.A., Research Assistant of the Institute of Industrial Relations, University of the City of Los Angeles.*

The three authors of this article conduct a workshop for executives at the University of the City of Los Angeles, called "Skill Practice In Supervision," and engage in executive and supervisory training in a variety of organizational settings.

"Sensitivity training," one approach to management development programs, emphasizes that executives should see themselves and others realistically, understand their own feelings and prejudices, and be sensitive to the ways people relate to each other. As the trainees examine themselves and the impact they have on one another, they also develop specific skills for the handling of various human relations problems. This novel training approach, clinical in its orientation, has resulted in far-reaching changes in the ways in which people work together on management teams.

IT HAPPENED at the fifth meeting. For four weeks, thirty executives had been coming to the campus of the University to attend a workshop in supervision. At each meeting they had sought to clarify their aims, and had continually tried to get the "professors" to lay down a set of rules. "You're the experts here," they said; "you tell us what we can do to become more effective!"

At the fifth meeting, the group's feeling about its own progress became the initial focus of discussion. The "talkers" participated as usual, conversation shifting rapidly from one point to another. Dissatisfaction was mounting, expressed through loud, snide remarks by some, and through apathy by others.

George Franklin appeared particularly disturbed. Finally, pounding the table, he exclaimed, "I don't know what is going on here! I should be paid for listening to this drivel. I'm getting just a bit sick of wasting my time around here. If the 'profs' don't put out—I quit!" George was pleased. He was angry and he had said so. As he sat back in his chair, he felt he had the group behind him. He felt he'd had the guts to say what most of the others were thinking! Some members of the group applauded loudly, but many others showed obvious disapproval. They wondered why George was excited over so trivial an issue; why he hadn't done something constructive rather than just sounding off, as usual. Why, they wondered, did he say their comments were "drivel"?

George Franklin became the focus of discussion. "What do you mean, George, by saying this is nonsense?" "What are you really mad at, George?" "What do you expect—a neat set of rules to meet all of your problems?" George was getting uncomfortable. These were questions difficult for him to answer. Gradually, he began to realize that a large part of the group disagreed with him; then he began to wonder why. He was learning something about people he hadn't known before. New questions were raised—some relating to the job: "How does it feel, George, to have people disagree with you when you thought you had them behind you?" "Is it important for you to know who is really with you and who isn't?" "How does this apply to the plant?" "What can we do to find out how our employees really feel about us?"

Bob White was first annoyed with George and now with the discussion. He was getting tense, a bit shaky perhaps. Bob didn't like anybody to get a raw deal—and he felt that George was getting it. At first, Bob tried to minimize George's outburst; then he suggested that the group get on to the real issues, but the group continued to focus on George. Finally, Bob said, "Why don't you leave George alone and stop picking on him? We're not getting anywhere this way."

With the help of the leaders, the group focused on Bob. "What do you mean, 'picking' on him?" "Why, Bob, have you tried to change the discussion?" "Why are you so protective of George?" Bob began to realize that the group *wanted* to focus on George; he also saw that George didn't think that he was being picked on, but felt that he was learning something about himself and about how others reacted to him. "Why do I always get 'upset,'" Bob began to wonder, "when people start to look at each other? Why do I feel sort of sick when people get angry at each other? Why don't my people ever talk back to me—do I let them get it off their chests, or do I cut them off?" Now Bob was learning something about how peo-

The names of persons mentioned in this article are fictitious.

ple saw him, while gaining some insight into his own behavior. Not much yet, but just enough to work on—perhaps. Some other time he would feel free to explore this a bit further.

Most executives, as illustrated above, can talk the "human relations" language, but fewer are able to put into practice some of the ideas to which they so readily subscribe. It is often interesting, for example, to watch some of the proponents of the "open-door" policy of communications violate the very spirit of the practice to which administratively they are so loudly committed. A recent hit play makes the same point dramatically when a commanding officer of an occupation unit in the Far East threatens to "teach the natives democracy if I have to shoot every one of them." Sensitivity training[1] attempts, therefore, to close the gap between knowing and doing by exposing the participants to both the intellectual and the emotional understanding needed for effective performance.

The Aims of Sensitivity Training

There are several specific aims in this type of training. First, each trainee should get a better picture of the kind of person he is, of the impact he has on others, and of the characteristic behaviors he employs to protect himself against real or imagined threats. As a result of the training process, he is likely to discover some of his "blind spots"—those problem areas in his personality which he is unable to perceive without gross distortion and which frequently operate to his detriment in relating to others.

Second, the participants should check the accuracy of their perceptions as to what other people are like. Many trainees tend to think in stereotypes, which if strong may drastically color their perceptions. Participants learn to recognize individual differences, to accept them for what they are, and to understand better how their own needs and desires distort their perceptions of others.

Third, the participants should obtain more factual information, useful and pertinent in this area. This may include some theory and research data on individual differences, personality, leadership, communication, and group dynamics.

Fourth, each trainee should develop new "human relations" skills, including ways of dealing with conflicts and tensions. As the participants put into practice their understanding of themselves and others, they learn how to communicate effectively, how to interview and listen, how to inform and evaluate, how to praise and discipline, and how to motivate. These specific skills can usually not be acquired until some of the insights mentioned above have first been attained.

Finally, the participants should be helped to become more aware of "group process," those forces unique to a group which ultimately may result in its success or failure. They should learn to recognize functional and blocking member roles; they should become aware of, and learn to deal with, "hidden agenda," those personal or situational pressures which simmer underneath a surface of good manners and friendly interchange; they should become acquainted with the procedural skills which allow a group to get its work done in the most expeditious manner.

The Nature of the Training Process

Sensitivity training is still experimental. As carried out in university workshops, group development laboratories, and plant settings, no single formula for conducting this type of training has been developed. In general, however, certain essential elements have emerged.

First, the training is "feeling-oriented" as well as "content-oriented." The participants learn to deal not only with specific cases and examples from their "on-the-job" situations, but also to analyze their own reactions and feelings toward one another and toward the situations in which they become involved at the training session.

Second, a certain amount of frustration appears to be essential to the success of the training. Each person attempts to keep his concept of himself intact, and little training impact can be expected unless the trainee is able to examine his "self-concept," to re-evaluate it, and to instigate those changes which he feels would benefit him. The process is not an easy one; we must experience frustration and anxiety in order to gain some insight into our "inner selves." These insights cannot be learned by reading a book; they arise most easily in the "give and take" of interpersonal relations.

Trainees Decide What To Talk About

Third, the training design is partly unstructured. Opportunities are provided for the trainees to decide what they want to talk about, what kinds of problems they desire to deal with, and what means to use in reaching their goals. As the trainees deal with these problems, they begin to act in characteristic ways—some participate freely, some remain silent, some dominate the discussion, and some become angry. These and other modes of dealing with problems become "grist for the mill"—they provide jumping-off points for discussion and analysis.

Fourth, auxiliary training devices and techniques are utilized to facilitate the interaction process among the participants. Included are the use of case studies, role-playing, buzz groups, film forums, and the like. At present, we think that these training devices should be introduced rather early in the training experience in order to place trainees in the kinds of situations to which they are more accustomed. As training progresses, artificial stimuli will be less frequently needed to produce the "raw material" of the training process.

Fifth, a permissive atmosphere is maintained. When people know that their attitudes are respected and their feelings accepted, full participation is facilitated. Since the expression of attitudes and feelings is essential to the training process, even when people feel they might appear unkind, impolite or perhaps ridiculous, the group atmosphere must remain friendly enough so that these sentiments can be elicited.

A permissive atmosphere is not easy to describe. We know it does not exist when the discussion leader insists on imposing his own goals, ideas and methods. We must not be fooled by the "let's all join in the fun" appeal of some service organizations, the "let's be a happy family" flavor of some industrial concerns or college campuses, or the

[1] For related philosophies and methods of training, see Robert Tannenbaum, Verne Kallejian, and Irving R. Weschler, "Training Managers for Leadership," *Personnel*, 30, 4, Jan., 1954, pp. 254-260; also Herbert A. Thelen, *Dynamics of Groups at Work*, Chicago, Ill., The University of Chicago Press, 1954, 379 pp., and National Training Laboratory in Group Development, *Explorations in Human Relations Training: An Assessment of Experience, 1947-1953*, Washington, D.C., National Education Association, 1953, 87 pp.

phony "hi, Joe!" variety of "hearty atmosphere." It is only when discussions are characterized by a lack of moralistic or judgmental attitudes toward almost anything that might be said, when people feel free to speak frankly and to listen with understanding that true "permissiveness" can be said to exist.

Expressions of Resistance to the Training Process

In the training situation, no attempt is made to tell participants whether to change or how to change. They are helped to see themselves more objectively; if, then, *they* are dissatisfied with certain aspects of their behavior, the decision to change and the direction of change is up to them.

Paradoxically, many of those who really want to profit find themselves blocked by feelings, fears, and anxieties from experiencing the deeper impact of the training process. These "defenses" keep them from making the kind of progress which they so earnestly desire.

Every one of us utilizes defenses, usually those with which we feel most comfortable. We use different ones at different times, and in various combinations and proportions, some more effectively and appropriately than others. Each person's particular pattern of defenses largely characterizes his personality.

It is rather easy to see some of the more familiar defenses in others, but very difficult to recognize them in ourselves: the "sour grapes" attitude ("we didn't want this contract, anyhow"); the displacement of hostility on an inappropriate person (arguing with one's wife when really feeling angry at the boss); the blaming of equipment for poor personal performance; the flight into fantasy ("when I am in charge of this department, things will be different!"). Some of us are great rationalizers; some of us take our troubles out on our subordinates; some of us see no faults in ourselves, but only in others; some of us develop bodily symptoms which have no organic basis. In any event, it is important to realize that we are not always conscious of the true motivation of all of our actions; too often, we are blissfully ignorant of the needs and fears which make us act as we do.

The training process focuses, in part, on the identification of those defenses that interfere with effective personal functioning in the work setting. But while some participants are able to achieve insight into how they act and react, others markedly resist this process and rigidly adhere to their original views of themselves and the world around them.

In the course of our experience, we have learned to identify some expressions which we think reflect typical resistances to this type of training.[2] Although any or all of these feelings may have some rational basis, the participants commonly fail to examine their validity and prefer to hold to their notions of what they are and how they are seen by others. Among the common phrases through which these feelings of resistance are expressed are:

1. "You can't change human nature". —This assumes that our personalities are fixed, that we are born to be stubborn, talkative, honest, treacherous, late for work, or leaders of men. If we believe this, then training can accomplish nothing. There is no point in getting involved in something which is bound to have little, if any, impact.

2. "I know myself better than anyone else ever will!" This person cannot accept the idea that hidden or unconscious drives and motives do exist. His best defenses for dealing with his unknown self — his proven tactics for avoiding possible exposure—are denial and rationalization.

3. "If there is one thing I know, it's how to deal with people." This person may readily admit lack of knowledge about the technical aspects of his job, but his self-picture does not permit weakness in the human relations department. His may believe strongly in himself and come to the training to be approved "as is." He often claims knowledge of how to handle a situation, and doesn't hesitate to tell someone else what to do. Prevented from getting evidence which might be contradictory to his expressed feelings of adequacy, he avoids testing the reality of whatever fears he has with reference to his abilities to relate to people.

4. "We are here to learn about human relations. You are the expert—so

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[2] Jack R. Gibb, who conducts leadership training programs at the University of Colorado, has recently described a similar set of expressions which serve his trainees as defenses against real or imagined threats to their self-concepts. See J. R. Gibb and Lorraine M. Gibb, *Applied Group Dynamics: A Laboratory Manual for Group Training in Human Relations Skill*, 1953, 121 pp. (mimeo).

Working Concepts Of Organization

by John D. Millet

Unfortunately, organizational theory does not ordinarily recognize the personality factor. In reality, this is apt to be an important if not a controlling consideration in determining the organizational structure of any agency. The desire or need to accommodate a certain individual may lead to modification in structure simply for the benefit of that individual, or because consideration accorded him may secure more important advantages. It has happened, for instance, that the entire field organization of a great agency was adjusted to one top man who insisted that he could "work" only in a direct command relationship to field installations. Many a reorganization has been wrecked on the reef of personality. The student in the classroom or the writer on organization may pretend that personality factors are unimportant; the administrator, in determining organizational structure may ignore them only at his own peril.

We may hear someone say, upon looking at an organization chart, "It may work; it all depends upon the individuals who are assigned to run it." In the present state of our knowledge about public administration, it is probably as sound to pick key individuals and build the organization around them as it is to establish the administrative structure and then seek the individuals to fill the key posts. . . .

The practical answer to the question of structure versus personality is a dual one. As Professor Dimock has explained (in *The Executive In Action*), "The wise executive realizes that good organization is made up in part at least of the peculiar skills of individuals and in part of the functions to be performed." The importance of the personality factor is further reflected in the fact that the same organization may, at different stages of development, require quite different personal types, as we shall see. Even in the military field, where organizational units are thought to be so many paws of standard value which can be moved from one part of the front to another and from one theatre of operations to another, the individualities available frequently determine organizational decisions. . . .

Excerpted from ADMINISTRATION *by Albert Lepawsky.*

give us the answers." Behind this attitude lies the more customary school experience which utilizes lectures, case materials, tests, and the like. Most people have learned to expect this type of activity whenever they take a course; moreover, experience with books and newspaper columns has taught them to look for specific answers, for rules and gimmicks to solve their human relations problems. Thus, they wish to submit to the trainer's authority, yet at the same time refuse to accept his caution that they will find answers only by participating in a dynamic group process.

5. "Let's stop getting personal—let's be mature and look at the facts!" The person who holds this belief does not like to deal with emotions, feelings, and perceptions. He thinks it unnecessary, if not outright dangerous. To him, every situation calls for a rational principle —the problem is to find the principle that applies. Demanding "the facts" in each instance, he refuses to accept emotions, feelings, and perceptions as facts.

6. "What do you expect us to do—psychoanalyze everybody?" This question reflects a major misunderstanding about the training process. At no time is it recommended that the "open thyself" atmosphere of the training process be transferred into day-to-day business operations. On the contrary, it is the unique motive of the training process which permits people to "see more and better" so that they can then react more effectively to the demands of their daily interpersonal contacts.

7. "I think this is great—I'm learning a lot by sitting back and *watching* all the others." This individual is convinced that there is something to the training process, but does not wish to get involved. By not participating, he avoids exposing himself. Thus he decreases his potential learning experience.

8. "We run a business, not a nursery school." This attitude implies that the training encourages impractical, time-consuming, and unrealistic supervisory practices. The trainee assumes that knowing the technical and administrative features of a job are sufficient; he believes that the way to solve problems in human relations is either to avoid them or to discipline those with whom he has difficulties. He fails to admit the possibility that his poor record in interpersonal relations may have its roots in his own behavior and is likely to cite the ample supply of labor as his main reason for not fooling with "employees who won't do their jobs."

9. "I don't know what you are doing to us, but I don't like it." Behind this expression is a fear that the person's individuality will be lost, that his initiative will disappear, and that his abilities will be attacked and his weaknesses magnified. He thinks that sensitivity training is an attempt at indoctrination over which he has no control. He does not realize that the training process is largely of the group's own making—that what is done is largely a function of what the group wants to do and how it wants to do it. The possibility that individuality is encouraged and enhanced by this type of experience through increasing realistic understanding is not admitted.

Evaluating the Training Results

Sensitivity training must be evaluated in terms of aims, methods and achievements. Ideally, this process should consist of three phases. First, a potential trainee should be appraised by his superiors, peers, subordinates, and himself prior to training. Second, his performance in training should be assessed by the trainers, the group members, and himself. Finally, he should be evaluated again by his superiors, peers, subordinates, and himself, some time after the training is completed.

The criteria of evaluation are likely to vary for each evaluator and for each situation. On the job, the trainee's superiors may stress the productivity of his work-groups, their morale, turnover, and similar factors. His peers may look for cooperation and friendliness. His subordinates may be more interested in understanding, acceptance of their frailties, or involvement in decision-making. He, himself, may be most concerned with his ability to handle day-to-day tasks, to keep production up, to deal with arguments and "hurt" feelings when they occur, and to avoid being "called-down" by his superiors.

In the training situation, the trainers may value greater insights into defenses, more realistic perception of others, understanding of communication processes, or newly-found awareness of the forces operating in a group. Fellow participants may stress willingness to understand and listen to others, effectiveness in role-playing, recognition of the impact on a discussion or efforts to help the progress of his group to achieve its goals. He, himself, may most wish to develop feelings of confidence and security, to improve his ability to handle tough situations, to gain skills in interviewing and listening, and to experience relief from some of the tensions and anxieties with which he feels himself saddled.

Self-assessment First Result Of Training

After the training, each group is apt to look for changes in the trainee's behavior related to the criteria first discussed above. The trainee himself, however, is likely to alter some of his criteria in terms of the experiences he has had in the training situation. Experience shows that if participation in the training process has been effective, the first impact will probably occur in the trainee's own perception about himself and others. His new self-assessment may lead to more confidence and security, and to less anxiety in his day-to-day relations on the job. Next, the repercussions of such insights will probably be felt by those with whom he deals. He may "blow up" less often, turn an attentive rather than a deaf ear to suggestions, or play a more constructive role in staff meetings. As he begins to feel his way and explores new behavior patterns, he must be supported by his co-workers to utilize the understanding and skills which he has learned. He needs an environment where human relations practices are part of the total organizational philosophy, where "gimmicks" and manipulative devices are recognized and deprecated for what they are.

As yet, the results of sensitivity training have not been subjected to a rigorous scientific analysis to ascertain the specific type and direction of changes which have undoubtedly taken place. However, reports from both trainees and co-workers indicate that this method of training does lead to greater "human relations" know-how, which in turn often seems to be followed by higher productivity, better morale, and lower turnover. Sensitivity training, of course, is not a "cure-all" for every organizational problems; there are too many other technical and administrative aspects to effective management. We do see it, however, as an exciting development in executive training—with a future rich in promise and in potential rewards. END

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Management Control

By Alex W. Rathe
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Successful management is largely determined by knowing what management should do and by knowing how to do it. Blueprinting the management process is like making a roadmap—it tells management what areas must be traversed in order to reach any destination. This article blueprints the areas of management and shows that the key to the management cycle is accurate feedback of information.

MANAGEMENT in simple terms means the direction of any activity. The manager makes things happen; he sees to it that things get done. And he does all this through others, through the work of those he manages.

This implies at once the need for attacking a problem with a carefully preconceived plan so that we can be certain we shall reach our objective in the best way. This first segment of managerial activity is often called "Planning." It forms the basis of the second segment, "Operations," which is guided by the plans.

The third segment of management endeavor, most unfortunately, has been termed "Control." In this segment the task is one of deliberately reviewing how operations conform to plans and of drawing conclusions from these results on how future plans might be improved, on the strength of current operating experience.

These three elements—planning, operating and control—form a cycle; the management cycle (Fig. 1). The first and third are often called "Management Control"; it is this meaning of the word which underlies these remarks.

The management cycle is not new, nor is it something special to business. It is a phenomenon of life which can be observed wherever there is human activity. Take the government, for instance: Its planning agency is the Legislature; the Executive Branch is charged with operations, and the Courts are entrusted with judicial review.

The exact location of the demarcation lines between these three segments appears at times to be questioned by some. The reason for this may well lie in the fact that the scope and responsibilities of all three elements—but especially of planning and control—are not always clearly defined.

The most important feature of the management cycle is, however, not the specific boundaries between its three elements; it is the fact that we deal here with a cycle, with a closed loop—if matters are arranged properly—in the engineering meaning of this term. The key in this circuit thus becomes feedback with its determined task to close the loop so as to guarantee the utilization of new knowledge as the prerequisite for progress. Feedback permits us, systematically and continually, to profit from experience—in engineering as well as in management.

Here, then, is the first opportunity for the Industrial Engineer to attempt an ever greater utilization of the body of knowledge in mechanical and electrical engineering, in servos and related fields, and to do so in the service of management problems. A brilliant path has been opened up by Dr. Norbert Wiener and his study of Cybernetics.[1] It spotlights, as few if any other developments in our field do, the constant devotion which the Industrial Engineer has to display to areas which border his own, such as psychology and many other sectors of the living sciences, in addition to his firm anchor point in the technical sciences.

Other possibilities for great engineering contributions in this field of Management Control will suggest themselves readily when we take a look at the first and third elements of this management cycle of planning—operations—control.

Planning: Planning means looking ahead, thinking in advance about operations. It determines what *should* take

[1] Norbert Wiener; Luther H. Gulick; Alex W. Rathe; et al; "Cybernetics and Society"; Executive Techniques, Inc.; New York, 1950.

place. It charts the course, prepares for action. It is the antithesis of speculation or hesitation, of playing by ear or flying by the seats of our pants.

Planning proceeds in two major steps: (1) it sets goals; (2) it designs the approach to these targets.

Techniques That Help Executives To Plan Work

There are many techniques which help the executive in his planning work. For the first step—establishment of goals—there are: (1) *Economic forecasting* and *market research;* both endeavor to peer into the future and to bring knowledge of things which are in the offing. (2) *Operating plans and programs;* they specify the exact action which is required, in every nook and corner of an enterprise, to reach the goals which have been set.

For the second step—design of the approach to the target—we find that all but the second and the last of an impressive array of techniques are recognized key areas of Industrial Engineering:

(1) *Organization,* which erects the framework within operations are carried on by assigning people to specific tasks.

(2) *Policies;* they lay down broad rules and establish general guides for all activities.

(3) *Methods, procedures* and *systems:* this threesome provides detailed operating instructions for factory floor, clerical work or any other task.

(4) *Standards* furnish operational yardsticks and set up criteria for time, quantity, quality, cost and many other significant aspects.

(5) *Schedules* supply time tables by which individual operations are dovetailed.

(6) *Budgets* finally, express the operating programs in terms of the most common denominator, namely money.

Control: All of these planning techniques are concerned with what has to be done in the future. Control, on the other hand, looks at what is going on right now. Before taking a closer look at the available techniques, a few words have to be said about existing terminology. So far, I have talked of "control" although many abhor this word as thoroughly as I do. The main reason for this dislike is the fact that this term has so many different and conflicting meanings:

(1) If one controls votes, he has the power to *influence* people.

(2) If an individual has his temper under control, he *suppresses* feelings.

(3) A pitcher has control of the ball if he can throw it where he and the catcher want it to go; "control" in this situation means "*planning*" and "*operating*" but not "control" in the sense of the management cycle.

(4) If I keep my car under control while skirting another automobile whose tire just blew out, I include in this term all three elements of the management cycle, namely *planning* (how to get around the obstacle), *doing* just that and *looking back* to make certain that my swerving path did not do any damage anywhere.

Whenever we use a term with many meanings, the problem will always be to determine just which of these possibilities are intended to apply in this case. Different people will choose different ones and this immediately creates difficulties.

To avoid this pitfall, I have suggested the use of the term "review" while others prefer "appraisal", "measurement", "evaluation" and still different terms. For our discussion here the significant point is not to create general agreement upon the term as such; what is desirable is general agreement.

If planning looks ahead, then control looks back, examining the tracks made in operating. It determines *what is taking place.* It thinks out the lessons of actual operations and watches how the existing plans are being realized.

For the first portion of the control task, a selection of the more generally employed measuring techniques:

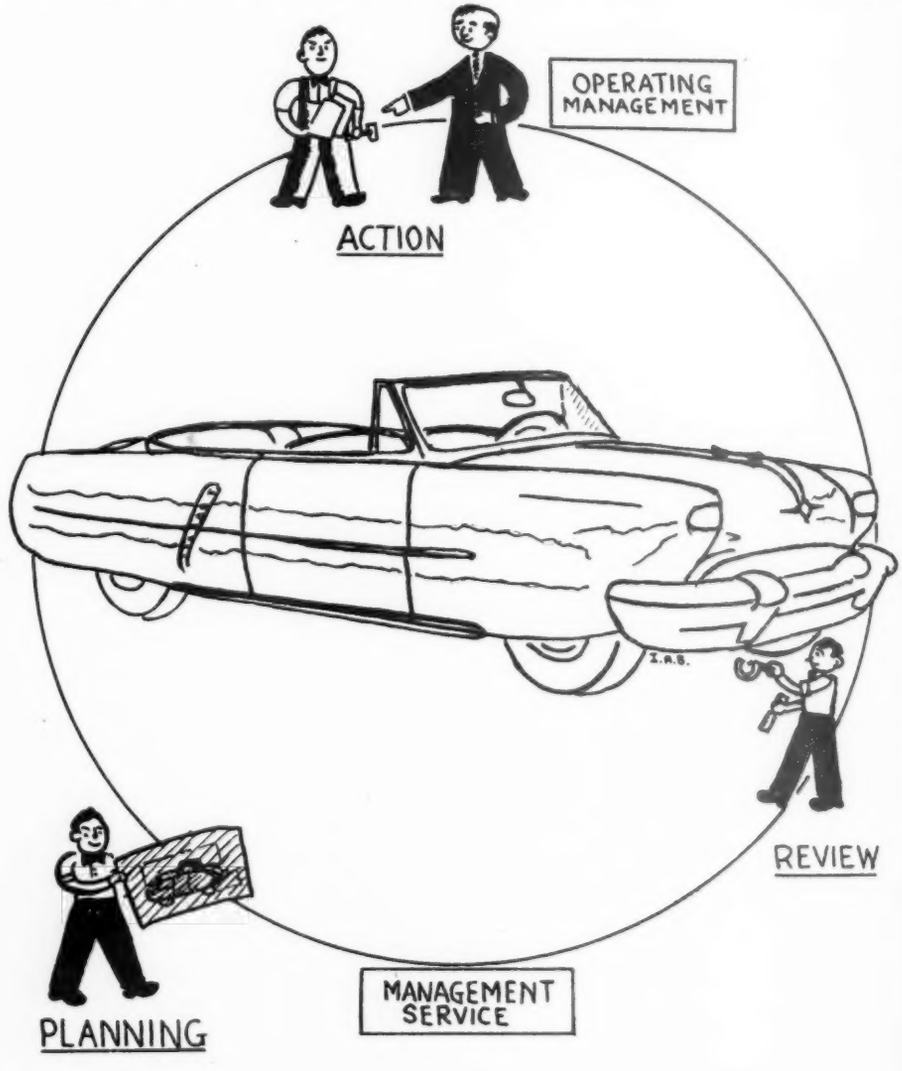
(1) *General and cost accounting* which provide data on the financial aspects of operations.

(2) *Production control* which gives information on the quantitative aspects of output (in the factory or in any other type of work).

(3) *Inspection* which supplies qualitative indicators of output.

(4) *Personnel measures* which report on the human element—as an individual or in groups.

(5) *Management control data* which furnish additional performance measures not generated by the techniques



mentioned before.

The toolkit of techniques for the second part of control work, that of appraisal, is much scantier; it includes (1) *statistical methods* which organize and summarize data into more compact and meaningful form; (2) *quality control* which interprets inspection data and recommends remedies for quality shortcomings; (3) *financial audits* which perform the same task in the accounting area; (4) *management surveys and studies* which should do so in the full domain of managerial activity.

In comparison to planning, these techniques represent a much smaller assortment; and fewer are in the field of Industrial Engineering.

The Industrial Engineer— A Mainstay of Management In Planning and Control

Yet despite this, the Industrial Engineer plays a key role in the areas of planning and control. All of his work takes place in these two out of the three segments of the management cycle. If his tasks take him into operations, he may do a good job in that sector as well but that moves him out of the legitimate engineering realm into that of the manager.

Another interesting recognition is this: The greatest weakness of the management cycle is the Industrial Engineer's greatest strength. May I illustrate this by an analog. The twin tasks of planning and control may be regarded as the "executive's instrument panel";[2] in this concept, planning is seen as the dial and control as the indicator hand.

For the dial to be fully useful it has to be calibrated. And this is a pure engineering task because it means the establishment of yardsticks; it demands the development of standards. And setting standards is the very problem that brought about the birth of what we now call the Industrial (or the Management) Engineer.

Providing management with reliable standards is one of its most pressing tasks because in so many areas, it is really more a 'case of the missing yardsticks'. To wit, we do not yet know how to set reliable standards for creative work — say, research results or copy writing; in the human field—for instance, morale or initiative of executives — and in many other intangible areas. They will remain intangible until the Industrial Engineer puts his engineering mind to work on this great challenge before his profession to make possible the measurement of the, as yet, unmeasurable.

There are just too many areas in which we cannot yet measure results and in which we thus lack clear-cut facts. We need a yardstick first before we can unequivocally designate how much to expect. Once we have one, we can establish a standard on the basis of which the planning dial could be calibrated.

When we cannot measure something factually, we have to rely upon opinion. This is synonymous with saying that we have to expect disagreement because opinions differ when different people are involved. As a matter of fact, opinions are likely to be as varied as the people who state them. This is borne out, for example, by the varying reactions which the final award of the Miss America prize provokes every year; and this happens to be a case in which, at least partially, measurement is possible.

Before the Industrial Engineer ventures into unexplored territory in his mission to develop yardsticks where they do not as yet exist, he has a wide area to cover in which current measuring rods are not fully reliable. Work Measurement is one of the key fields of Industrial Engineering. In most cases we use time to measure work; and we do not need the full complement of engineering knowledge to realize that there can be a world of difference between "time" and "work".

The Dollar Is Not A Stable Standard

Lest I be accused of singling out just one field for criticism of existing weaknesses, may I suggest a glimpse into neighboring territories, say Economics. Take the meaning of the dollar. We use the same 'standard' for two entirely different purposes—for measuring economic as well as monetary value. These are two different items because, through the passage of time, the "purchasing power" of the money changes.

This is why subsequent dollar figures on, say, the balance sheet actually use different yardsticks: *Cash* is gauged in its current value while the next line on the statement, *Equipment*, is measured by dollars with the purchasing power they had years ago when these items were bought. When we reach *Inventories* we have to resort to a completely artificial valuation system ("fifo", "lifo", and many others) in an attempt to compensate for the distortions which variances in purchasing power cause all the way through every phase of economic activity.

Management's Challenge— Get More Useful Facts

Much could be said about many other possible contributions to Management Control by the Industrial Engineer in his efforts to bolster the arsenal of techniques by replacing hunch with facts, and guess with figures; by putting his engineering knowledge to work in the service of management. The ever-increasing use of statistical and mathematical methodology is a case in point. Operations research, linear programming, application of game and information theory and many other areas could be cited in support of this contention.

Each merits a paper for itself because of its potential usefulness in this pioneering campaign to push back the borders of the art of management through engineering contributions. For the purposes of this brief survey I would like to dwell for another moment, however, upon the previous point: the engineer's age-old task of developing standards.

This makes it mandatory for us not only to design them for their accuracy, validity and reliability but, above all, for their usefulness in practice. This then is the second challenge (and a tremendous one) to the imagination of our profession: to provide more and more useful facts for management.

Facts are the foundation of any science. They are the most common building stone of all engineering work. To provide them in the field of management has proven to be, to those of us who have been engaged in this area, a most challenging and rewarding assignment. It will once again bring about another engineering contribution to the practicing executive which is bound to be of lasting significance. This is so because, if we do not have facts, if we allow ourselves to be governed by opinion where it is possible to obtain facts, we shall—as Gantt said more than a generation ago—lose in our competition with those who base their actions on facts. END

[2] Rathe, Alex W., "How to Set up Management Controls"; Funk & Wagnalls Company; New York; 1948.

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Automation—Advances in Automatic Production

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Automation-mechanized and self-regulating processing is the new hope of industry. Successful automation, in one stroke, cuts costs, saves labor, improves quality and increases output—surely a highly desirable set of conditions. This comprehensive article clearly relates how automation does all of these things.

A RELATIVELY new term—*automation*—has come to be associated with the trend toward automatic production. Current literature has accorded automation the distinction of being a new technology. It has even been referred to by some as the basis of the second industrial revolution. Regardless of the semantics of the situation, one thing that is well agreed-upon is the tremendous influence that this movement promises to have on the future development of American industry. To fully grasp the significance of this movement, these questions must be answered:

a. What is automation?

b. How is automation applied?

c. What factors must be considered and what problems must be overcome in applying automation?

d. What will be the impact of automation on the community at large?

Automation is the characteristic of continuous self-motion and self-control in industrial operations. It signifies the *mechanization* and *self-regulation* of the processing, Materials Handling and inspection functions of an entire operation. Visualized in the broadest sense, it can be applied to electrical as well as factory operations.

It is important to recognize and emphasize that automation, as described here, includes both *mechanization* and *self-regulation*. Mechanization in industrial operations is not uncommon. However, it is the application of self-regulation to the mechanized process that enables continuous production of a given requirement without human intervention, and this is the distinguishing characteristic of automation. This is the characteristic which gives automation such great potential.

The forementioned self-regulatory technique is known as *feedback* or *closed-loop* control. Closed-loop control, as distinguished from open-loop control, is based on the self-regulating action of the control system on the output performance of a process. Information regarding the amount of variation of the output from requirements is fed back to the process input. The control system then causes a correction to be made to the input, and this enables the process requirements to be met.

Feedback can be somewhat illustrated by the functioning of the home thermostat, which automatically controls the furnace, depending upon room temperature. As the room temperature rises above the thermostat setting, the thermostat acts to shut off the furnace. As the room temperaure falls below the thermostat setting, the thermostat acts to start the furnace and increase the temperature. Here the closed circuit may be visualized by the fact that the thermostat's function depends on the room temperature and the room temperature depends upon the thermostat's function.

In a manufacturing process, feedback can be described by the action in a ball race grinding operation on a bearing ring. The ball race diameter of the ring is automatically gauged immediately after the grinding is completed. The gauging information is then automatically fed back to the grinding wheel control mechanism which adjusts the depth of the grinding wheel feed, if necessary. The action of the grinding wheel depends upon the feedback mechanism and the action of the feedback mechanism depends upon the grinding wheel.

It is this interdependence of action which is typical of feed-back or closed-loop controls.

Automation is not new. As early as 1784, a continuous process flour mill operated near Philadelphia. This mill required no human labor from the time the grain was received at the mill until

it had been processed into finished flour. More recently, the military requirements of World War II gave substantial impetus to the development of closed-loop control systems in the design and construction of automatic gun-control directors, which also resulted in the accumulation of a large amount of technical knowledge on this subject.

Today's best examples of over-all automation are found in the chemical and petroleum processing industries. In these cases, a large number of varying process characteristics (such as pressures, temperatures, mixtures) are constantly and automatically controlled.

While these examples refer to process industries and involve control of entire processes such as chemical reactions on continuous, homogeneous materials (liquids and solids), automation can be applied to individual machines or groups of machines processing individual units such as would be encountered in the metalworking industries. Furthermore, it is feasible (as will be explained) to think of automation for the job shop as well as for those shops characterized by high volume of one or a few products.

Principles Of Automation

At this point, we can summarize the generally recognized, basic principles for the application of automation to manufacturing operations. While these principles emphasize an integrated or unified sequence of operations suited primarily to a high volume product, the fundamental ideas are universal for application to individual machines and small runs.

1. *Never let go of the product-material until it is finished, assembled and packaged.* This can best be accomplished through integration which involves continuous, straight, balanced flow of material over machines which are lined-up as close as possible to each other and for which the line is started as close as possible to the raw material state. It also requires moving parts immediately from one operation to the next and eliminating accumulations of parts between operations.

2. *Employ automatic gauging at each operation and tie-in with closed-loop control or feedback.* In relation to the first principle of never letting go of the product, this requires gauging immediately upon completion of or during each operation, and also gauging of trends (as well as upper and lower limits) in order to feed back corrective data to the equipment input.

3. *Develop straight-line flow of material and maximum production line compactness.* This requires slowing down fast machines and integrating production machinery designed to meet specific product requirements.

4. *Control all line functions from one master control point.*

New Departure's Approach To Automation

At New Departure we are applying three basic approaches to the application of automation so that eventually both high-and low-volume product sizes will be affected.

1. The first approach involves application of mechanization, automatic gauging and feedback control to the handling and processing for as many as possible of the operations on integrated lines for individual high volume products. In general, it has only been possible to apply automation to portions of an integrated line and in degrees.

Automatic Materials Handling of individual units has been applied to sequences of operations, including loading, unloading and transport between machines. This has been accomplished through an effective combination of vibration-type conveyors and hopper-feeds tied in with automatic chucking on the individual machines.

Automatic gauging has been applied to various operations such as surface, O.D. and I.D. grinding. Two methods of gauging are employed; namely, individual piece gauging and trend gauging. The automatic gauging includes ejecting bad parts (on individual piece gauging), stopping the machine and/or lighting a signal. In some cases, the signal devices are also used to highlight that a process is *nearing* allowable limits.

A further step in applying automation has now seen the successful development of feedback control devices tied in with the automatic gauging.

2. The second approach involves the application of automation techniques to individual types of machines for individual operations. This includes employment of automatic handling (for loading and unloading), automatic gauging and feedback. Feedback control devices have been developed for both O.D. grinders and race grinders. Furthermore, as evidence of the possible application of automation to small runs, the O.D. grinder can be changed over to a different size in one to two hours and the race grinder can be changed over in three to four hours.

3. The third approach involves redesign of the process to permit application of automation. For example, there is being developed an automatic machine which will manufacture completed bearing rings from hardened steel tubing. This machine will grind O.D., I.D. ball race and face, cut off the finished part and eject it into the material flow toward the next series of operations. This contrasts with the present process which requires four to six machines for the same operations.

Application of automation in the chemical and petroleum processing fields has already been mentioned; however, other examples in the metalworking fields can be cited:

1. The now famous "Project Tinkertoy", which was developed by the US Navy, the National Bureau of Standards and several industrial companies, is a highly automatic factory for the production of electronic parts. The cost of a finished unit from this factory is about one-half as much as a conventional unit.

How Industry Is Using SAM Rating Films . . .

- Reduce time, cost of time study training
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- Derive predetermined times
- Set new standards, audit old ones
- Explain philosophy of time study technique
- Help company make its own films

To accomplish this, extensive product redesign was necessary, but such action may often be a requisite of automating a process.

2. The Rockford, Illinois, Ordnance Plant is a highly automatic factory for the manufacture of 155 mm. steel shell casings from raw steel. The Materials Handling equipment used here serves as an excellent example of overcoming the problem of automating individual units. The sequence of operations, fully automatic, includes heat treating steel stock, descaling, forging, cooling, machining and storage. Only the removal of shells from the line for inspection is manual. As would be expected, the plant employs a high proportion of engineers and maintenance men compared to the number of machine operators.

Clerical Operations

Noteworthy progress has also been made in the mechanization of clerical or paperwork operations. It is in this field that electronic equipment will have its most immediate and widespread effect on business. While Materials-Handling problems in factory operations may be very difficult to solve from the standpoint of automating a process, the handling of information (the material of clerical operations) is relatively simpler. The electronic computers which perform these operations are often called "electronic brains"; however, they are not really brains since they cannot to do anything they haven't been instructed to do.

This equipment will automatically receive information, file (or store) the information, make calculations from the information, reproduce the original information or the results of the calculations—all at very great speeds. In fact, many of the problems solved by computers could not have been solved before manually, primarily because the solution would have required a tremendous number of man-hours in order to be completed on time.

At New Departure extensive work has been done in the use of electronic equipment for performing many clerical operations. Such jobs as production planning, inventory control, accounting control, order writing, billing, sales control are completed quickly and accurately with automatic equipment. A valuable by-product of this set-up has been the ability to do special analysis work from the basic set-up. These analyses would ordinarily consume a very large number of clerical man-hours—so much so that they probably wouldn't be done.

American Airlines employs an "electronic brain" called the Reservisor which maintains a perpetual inventory of reserved and unreserved seats for various flights. The machine is controlled from the ticket agent's window for input of information on seats being sold and for output of information regarding availability of seats. Data on travel space is available within seconds.

John Plain Company, a mail-order house, employs an electronic brain for purposes of stock control. Data on availability of goods to fill orders is available in seconds. At the Institute of Advanced Study in Princeton, New Jersey, an electronic computer develops, in three hours, weather predictions that would require three centuries for a person operating an adding machine. The Sunray Oil Company has an electronic computing device that calculates oil flow data through 124 pipelines in three minutes, a task that formerly took a skilled accountant a full day.

Computers In The Shop

A very important application of an "electronic brain" in the production field is the Numerically Controlled Milling Machine at M.I.T. This application illustrates a manner in which computers may be employed to achieve substantial automation in factory operations on individual machines processing short run-jobs. It is this technique which will give automation the necessary flexibility required for wide application, limited only by the application of universal tooling and chucking.

The cutting tool of the M.I.T. miller moves over the work in response to a series of instructions previously recorded in numerical code on paper tape, which works in similar fashion to the old piano roll. Any operation that the machine is capable of doing within its own limits may be put on the tape. The tape programming itself is not difficult but may require substantial time. However, once programmed on tape, a particular job may be easily run again, at any time in the future.

The Future of Computers

Growth of the use of computers in industry will depend primarily on greater reliability, simplified maintenance, lower cost and consumer education of the capabilities of such equipment. Low-priced and easily operated equipment may be made available in the not too distant future.

The application of automation will be a gradual process. Actually, it is not advisable to order highly automatic equipment for a process already in effect and expect to merely plug in the equipment to get the desired results. In approaching automation, it is necessary to think beyond mere duplication of the manual activities of the present machine operators. Utterly objective thinking, uncluttered by past ideas, is required. Many factors and problems can and must be considered in order to achieve the most efficient solution of the automation problem.

There are several reasons for getting into automation, the most important of which is the potential cost saving through reduction of both direct and indirect labor content in the product.

Other considerations are:

1. Need for uniform, high quality

Automated equipment, once set-up, does not suffer from the usual human errors which cause deviations in product quality. Also, the feedback control mechanism can be set to correct the machine more quickly than would be the case

SAM Chapter Performance Awards Report

July 1, 1954 - February 28, 1955

Philadelphia	10,105	Montreal	2,960
Lancaster	7,252	Madison	2,918
Binghamton	6,011	Dallas	2,902
N.E. Penna.	5,604	Fox Valley	2,770
New Haven	5,598	Portland	2,604
Washington	5,335	Raritan Valley	2,602
North. N. J.	5,041	Columbus	2,350
Nashville	4,968	Reading	2,269
Alabama	4,675	Central Pa.	2,176
Baltimore	4,583	West. Mass.	2,045
Kansas City	4,526	New York	1,964
Knoxville	4,335	West. N. C.	1,961
Pittsburgh	4,259	Wilmington	1,910
Greenville	4,252	Detroit	1,850
Worcester	4,252	San Francisco	1,821
Boston	4,205	Georgia	1,637
Richmond	4,140	Central N. Y.	1,482
Trenton	4,111	Sacramento	1,188
Indianapolis	4,015	Los Angeles	864
Hudson Valley	3,976	St. Louis	699
Lehigh Valley	3,973	Calumet	
New Orleans	3,951	Charlotte	
Cleveland	3,895	Cincinnati	
Milwaukee	3,699	Dayton	
Twin City	3,696	Greensboro	
Bridgeport	3,680	Hartford	
Chicago	3,594	Louisville	
Providence	3,437	Stamford	
Clearing	3,021		

under manual operation. The net result: *uniform, high quality output.*

2. Need for speed

In order to run some automatic operations at capacity, it is necessary to balance them with other automatic operations where human beings would be incapable of keeping up with the cycle. Another situation is the case of the long operational time that would be required, and would be impractical or very expensive, unless the operation were made automatic as illustrated by the mechanized clerical tasks previously mentioned.

3. Safety Requirements

Many industrial operations are performed today under conditions of speed, temperature and contact with dangerous elements that make labor undesirable, if not impracticable. Automated operations reduce these hazards to employees.

Product And Process Design

Automation of an industrial process may require product and/or process redesign, which may be either very simple or very complex and extensive. Basically, analysis in this area should include consideration of the *functions* of the parts of the product and the elements of the process in terms of manufacturing techniques which can be automated.

An excellent example of product and process change for automation is the complete redesign of radio circuits and use of the printed circuit technique in "Operation Tinkertoy". The printed circuit enables the radio elements to function as heretofore, but also permits an entirely different method of fabrication —one which lends itself to automation very readily. On the other hand, attempts to automate the assembly of conventional radio circuit assemblies would have been extremely difficult and probably uneconomical.

Equipment Design

Careful consideration should be given to the degree of flexibility available in the equipment to be employed to obtain automatic production. Today, most automatic production is effected on single-purpose machines, capable of processing only one product, such as the automated Ford engine line, at the Ford Motor Company's Cleveland Engine Plant.

This type of set-up is limited to long runs of the same product. Slight changes in the product generally require expensive changes in the machine or may even cause obsolescence. This problem is even more accentuated where several machines are tied together in an integrated production process.

Of course, if business were to limit changes in style and product improvements, single-purpose automatic machines could be employed more extensively. However, the American economy is too dynamic to enable such a situation to exist for long. Thus, in order to apply automation (without fear) on as wide a scale as possible, it is necessary to develop flexibility in the equipment to be employed. With so much emphasis on high production rates, it is obvious that the cost of machine downtime will be very high when using automatic equipment. Therefore, equipment designers must also emphasize reliability, easy maintenance, quick servicing and repair. For example, in maintenance work, instead of repairing or replacing just one defective part or an improperly functioning complicated wiring set-up, machines may be designed so that entire sections of equipment can be removed and replaced, an operation which would require just a few minutes. Also, tool changes will have to be simplified so that they can be made quickly and according to a plan.

It should be recognized that integration of the process elements and use of special-purpose equipment is such a tremendously effective way of applying automation from a cost standpoint, that it should not be overlooked, despite the limitations. The Sales Manager can, in certain cases, play an important role in helping to lessen the effect of these limitations. An organization characterized by production of a wide variety of products may be able to channel its sales effort and offer a very attractive combination of price, quality and delivery on one or a few standard products, so that potential customers just could not afford to buy them. The probable result would be enough volume, on the one or the few standardized products, to enable use of integrated, single-purpose equipment. This in turn, will probably permit still more attractive combinations of price, quality and delivery and result in still more volume on the limited number of products. *One warning*: The circle of events may also work in reverse.

Cost Considerations

The usual cost questions which arise

JUNE CHAPTER ACTIVITIES

CHAPTER	SUBJECT	SPEAKER	TITLE	PLACE	DATE
Kansas City	Kansas City Management Conference			Kansas City University	6-10
	Social Meeting for Participants of the Kansas City Management Conference			Saddle and Sirloin Club	8
Milwaukee	Annual Fun Night			E.S.M. Building, 3112 W. Highland Ave.	9
New York	Women in Management and Engineering	Panel to be Announced		Hotel Shelton	16
Northeastern	Annual General Membership Meeting—Social Get-Together				6
Western N. Carolina	Annual Dinner Meeting and Ladies Night			George Vanderbilt Hotel, Asheville	8

when investing in any new piece of equipment must be answered. They are:

1. How much savings will there be?
2. Will the savings enable an adequate return on investment?

Of course, in applying automation, there may be problems other than cost; such as safety, quality, output, etc. An additional factor to consider, particularly where special-purpose equipment is concerned, is the probability of product change which would require modifications to the equipment or possibly make it obsolete. The probability of reduction of volume is another potent factor to be estimated, for if this situation develops, expected savings may not be realized. It is not an unlikely conclusion that, in order to compensate for these risks, higher returns on investment may be required.

Organization

As more and more mechanization is attained, the whole industrial organization will have to be able to move faster and faster, primarily because of the very large cost of lost production time. It means figuratively "being able to turn on a dime".

Personnel Requirements

Automatic production will also bring a change in personnel requirements. More and more machine operator skills will be transferred to the machine and operators will be relatively fewer in number. Plants will need more skills in designing, building, servicing and maintaining automatic equipment. More engineers, technicians and skilled maintenance personnel will be required. Thus, the automated plant will not be without people, but will need people with different skills than now in use. Management should start thinking now about obtaining the necessary specialist. In many cases, this will involve company training programs in line with specific internal needs resulting from the move toward automation.

In the automatic plant, a very large part *of* or the whole operation cycle will be machine-controlled. Therefore, it will not be easy to relate an individual's effort to his output. And, of course, it will also be difficult to develop practical monetary incentives for employees.

With the machine exercising such a large controlling effect on output, emphasis will have to be placed on minimizing machine downtime. With this as a goal, machine utilization may become the satisfactory base of an incentive program.

Another incentive problem that must be reviewed will be the one dealing with incentives for indirect labor personnel, particularly maintenance and service people. As the proportion of indirect labor to the total plant force increases, as the labor cost of maintenance becomes considerably higher, as the cost of machine downtime increases, there will be a very strong need to consider appropriate indirect labor incentives.

SAM National Meetings — 1955

May 28, 1955.....Executive Committee
June 25, 1955.....Board of Directors

From the standpoint of organization and people, this will require:

1. Developing an organization and planning techniques which will enable the making of decisions quickly and at the lowest possible level, providing supervision with predetermined alternative plans of action to be promptly employed under varying conditions of operation, closely examining responsibility and authority.

2. Developing organization procedures and techniques which permit fast, direct communications even at the expense of at first bypassing several levels of the organization; communicating in simple, straightforward language as briefly as possible and employing only useful and necessary material.

3. Obtaining, training and organizing the high calibre management personnel required, particularly people who are capable and willing to take responsibility, who are imaginative and have broad capacity. *The overall organization result will be: greater decentralization of control and action.*

Maintenance

The maintenance function will play a very important role in the automatic plant. Certain requisites stand out now. They are:

1. Sound organization, good communications and the ability to move fast.
2. Advanced technical skills.
3. Preventive maintenance programs.

The topic of automatic production and workerless factories brings to the fore the fear of mass industrial unemployment. However, before sanctioning this fear, certain facts should be reviewed.

First, the change in employment will be partly a shift in the *kinds* of skills required in the factory. Second, many new jobs will open up in those industries building and servicing automation equipment. Third, the personnel affected by automation developments are primarily in manufacturing industries and represent only about one-fourth of the total employed people in the United States. Therefore, the potential changes can probably best be described as *temporary dislocations.*

Automation The Key To Increased Productivity

If we take a birds-eye view of the requirements of our national economy between now and 1960, it becomes evident that automation will play an extremely important role. Considering the necessary growth in the Gross National Product in order to maintain an increasing standard of living and relating it to an estimated growth in population, it is apparent that it will be necessary for output per worker to increase approximately 40%. It is probable that this productivity increase will not be achieved to any large degree by longer hours, working faster, improving personal efficiency. Rather it is new technological developments, as typified in automation, that offer the greatest hopes for achieving this goal.

The result: automation in the long run can only mean "more and better things for more people."

Automation has now been described; methods of application have been outlined; its effects have been predicted; the problems that can be expected to arise have been pointed out and the probable solutions indicated. There is no doubt that the trend toward automation will move forward at an ever increasing pace.

The question that each one of us must answer for himself is this: "How fast shall I move in this direction?" Each man's answer and action will be the key as to whether his company will maintain or improve its own position in today's and tomorrow's competitive economy. END

New Management Writing . . .

THE THEORY OF COLLECTIVE BARGAINING

By W. H. Hutt, with a preface by Ludwig von Mises. Published by The Free Press, Glencoe, Ill. 1954.

Prof. Hutt has put into book form an acute economic analysis of the impact of trade unions on the determination of wage levels. This slim volume is based in part on lectures which he gave in South Africa twenty-five years ago. Its conclusions are as timely as the morning paper.

There is a wealth of scholarship in the small compass of this book. Prof. Hutt goes back to the origins of economic thinking about the determination of wages with and without labor organizations and demolishes the theory, dear to many, that labor is at a disadvantage vis-a-vis the employer in reaching agreement concerning wages, and that therefore "labor"—i.e., employees—must be organized in order to deal with employers on a basis of equality.

The demolition of the wage-fund theory opened the way for the theory of "indeterminateness" of wage levels, and led many economists to conclude that since the market-place could not definitely determine wage levels, labor unions could raise the proportion of the product that went to labor.

Prof. Hutt carefully points out the errors in this line of economic thinking, traversing the entire gamut of wage economics in the process. He concludes, on the basis of theoretical analysis, that labor unions cannot raise real wages, except that where labor and capital are both organized for collective bargaining purposes, the resulting "bilateral monopoly" may increase the returns of both capital and labor by exploiting the consumer.

Although Prof. Hutt's book is based in part on lectures given over 25 years ago, his keen theoretical analysis reaches largely the same conclusions as those reached by three American university economists who discussed the impact of unionization on labor's share of the national product at the Industrial Relations Research Association's annual meeting in December, 1953*. Basing their conclusions on surveys of actual results rather than economic theory, the researchers generally agreed that collective bargaining probably has not resulted in a larger share of the national product for employees than they would have received in the absence of labor unions. Prof. Hutt establishes the theoretical framework for the facts as they are now known. Unfortunately, neither the facts nor the theory have received adequate dissemination or general understanding.

Prof. Hutt has not in this book devoted any attention to the role of government in changing the proportion of gross national product going to the various factors of production. It is recognized, for example, that the artificially low interest rates established and maintained by the federal government have resulted in a much lower proportion of total product going to the rentiers and bondholders, and larger proportions to others. Prof. Hutt's sole concern is whether organization of employees per se can increase employee share of total products. He concludes, correctly, that it cannot.

This is not to say that labor unions may not have other, and more valid, justification for their existence. Prof. Hutt does not undertake to consider the social or political implications. He considers only the narrow function of collective bargaining as a detriment of wage levels. In this area, the present reviewer can only add his "me too" to the concluding paragraph of Ludwig Von Mises' Preface:

> *Professor Hutt's brilliant essay is not merely a contribution to the history of economic thought. It is rather a critical analysis of the arguments advanced by economists from Adam Smith down and by the spokesmen of the unions in favor of the thesis that unionism can raise wage rates above the market level without harm to anybody else than the "exploiters." As such it is of utmost use not only to every student of economics but to everybody who wants to form a well-founded opinion about one of the most vital as well as most controversial political issues of our age.*

Leo Teplow
Industrial Relations Consultant
American Iron & Steel Institute
New York City

* See *I R R A Annual Proceedings*, 1953.

HUMAN RELATIONS IN SMALL INDUSTRY

By John Perry. Published by McGraw-Hill.

Mr. Perry has created a comprehensive study of current human relations principles and techniques slanted toward the "small" business. The latter he defines as a plant where the chief executive knows personally most of the first-line supervisors. I earnestly recommend the book not only to presidents of small factories, but to local plant managers of today's huge decentralized corporations.

The book is a mixture of basic principles and philosophy together with recommended techniques for implementing this philosophy. Actually, what Mr. Perry has written is a once-over lightly review of management of small enterprise. The American Management Association defines management as getting things done through people. That means management problems are human relations problems and therefore if you understand and practice good human relations, you are well on the way toward being a good manager. Subjects covered are the expected ones of morale building, communications, union relations, job satisfaction, executive selection and development, company organization, personnel administration, etc. It is written for line management, in particular the president or general manager. It is not a handbook for personnel directors.

It is in principles and philosophy that Mr. Perry has the most to contribute. His treatment of the subject of conflict — conflict between individuals and groups — is to me the one really new and provocative concept. Too much of our time is wasted, according to the author, in trying to suppress conflict. Conflict is not only unavoidable but necessary to progress and good morale. His principles are presented clearly with plenty of case histories. The eighth chapter, "The Meaning of Conflict", is the high point of the book. In it are presented and compared the three ways to resolve conflict (but not to remove it or suppress it) in ascending order of soundness: (1) domination, (2) compromise, (3) integration. The last is the only method that has lasting benefit to

the organization. If you "integrate" a conflict, everybody wins and nobody loses face. Such a solution takes time and ingenuity, but is worth the effort.

Another original approach concerns loyalty. Loyalty is not blind acquiescence to management's wishes, but means that an individual feels part of the company, that he belongs and is needed. Just because someone is loyal to a group within the company, such as a labor union or some informal group and is not "loyal" to management, is not necessarily a bad thing at all and does not mean he is disloyal to the company. Many of us were ardent Republicans under Roosevelt and Truman; I dare anyone to accuse me of not being a loyal American.

Mr. Perry somewhat contradicts himself in presenting his material. He emphasizes early in the book that there are no canned human relations programs; each company must work out its own policies from the top down. His presentation of fundamentals is thorough and original. In the last half of the book, however, he gets into detailed techniques: how to hire executives, how to improve communications, communication media, etc., which are somewhat anti-climactic. One almost feels that Mr. Perry felt obligated to fill up a 300 page book rather than merely present his philosophy, and as a result presents "canned" programs to implement his principles.

All in all I find Mr. Perry's book a real contribution to scientific management. He presents many fresh and stimulating ideas. There is no question he has a vast reservoir of successful experience in the field of industrial psychology and has made a definite contribution to the better utilization of people toward the end of helping top management run a happier and more prosperous business.

A. C. Gilbert, Jr., Pres.,
A. C. Gilbert Company
New Haven, Conn.

BUSINESS WITHOUT BOUNDARY,
The Story of General Mills

By James Gray. University of Minnesota Press. 1954. 343 pps. $4.75.

The author of this book is a Professor of English at the University of Minnesota. He has brought together here the success story of an organization that, along with many others, typifies what has happened in America in the past by reason of the opportunities that our economic system has been able to provide to those unusual individuals who have been able to envision the future and then meet competition in the market place on such terms that enough persons have purchased their products willingly to make it into a major enterprise.

While "Betty Crocker" is better known than General Mills, probably few persons know how "Betty Crocker" came to be associated with General Mills. In fact, this well-known personality becomes simply an incident in the efforts of capable men to better serve the needs of their market as they see it.

The story of a technological revolution in the handling of wheat and in the making of flour that made possible "baked goods" as we know them today; of merchandising methods that were, as every new idea is, considered foolish, but which competitors came to copy in one way or another; of the men who built the team that did this great job and made of Minneapolis the milling center of the world; of the problems of the largest miller in the world and the difficulties of staying on top; and the stories of Wheaties, the life and times of Betty Crocker, and of difficulties in the depression, of vitamins, Cheerios, and Bisquick, of World War II, and of expanded research on new products as diversified as giant, plastic balloons for launching in the stratosphere for the U. S. Navy, and a wide range of other military products.

For anyone interested in the history of a large business enterprise, or for acquiring an understanding of what makes business tick in this nation of ours, this book will have much value as another contribution to the history of what makes America's productive system the envy of the rest of the world.

Ivan R. Bierly
Executive Secretary
The Foundation for
Economic Education

CIPM Reports . . .

URWICK TO RECEIVE WALLACE CLARK AWARD

Colonel Lyndall Urwick

COLONEL LYNDALL URWICK of Great Britain will accept the Wallace Clark Award for "Distinguished Contribution to Scientific Management in the International Field" at a CIPM luncheon on Tuesday, May 24.

The idea of this award was developed in 1948 in the SAM, and under Dr. Lillian Gilbreth it was arranged that CIPM should assume the trusteeship for it, with SAM, the American Society of Mechanical Engineers, the American Management Association, and the Association of Consulting Management Engineers as sponsors. The Wallace Clark Medal was established officially in 1949, and it commemorates the service and contribution to the international management field made by Wallace Clark, management engineer.

Colonel Urwick has been one of the most important figures in both British management and international management for a quarter of a century. A graduate of Oxford, he worked with Seebohm Roundtree at the Oxford Management Conferences, and in 1927 became Honorary Secretary of seven Management Research Groups founded by Mr. Roundtree to pool advanced management ideas in England. Some of his subsequent positions include Director of the International Management Institute in Geneva, and Chairman of the Education Committee of the British Institute of Management, which he was instrumental in establishing. In 1934 he founded the management consultant firm of Urwick Orr & Partners, Ltd., and he was its Managing Director from 1945 to 1950. He presently holds the Office of Chairman of this firm. Colonel Urwick is the author of numerous books and articles on management, one of the latest being *Management Education in American Business*, the first of a series of four publications on executive development and employee education in American industry. Colonel Urwick received the CIOS Gold Medal in 1951, and was Secretary-General of CIOS from 1932 to 1935. END

The Council for International Progress in Management, formerly the National Management Council, is a non-profit, non-political organization devoted to the promotion of the practice of scientific management on the international level. SAM is a co-founder and charter member of CIPM.

Books Recently Published

Profit Sharing In American Business
A Study Of Methods Used To Maintain And Sustain Profit-Sharing Plans. By Edwin B. Flippo. Published by Ohio State University, Columbus, Ohio.

Fundamentals Of Auditing
A Modern Explanation of Basic Audit Techniques and Their Application. By R. K. Mautz. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York City 16. Price $6.00.

The Case Against 'Right-To-Work' Laws
A joint publication of the CIO's Legislative, Legal and Education and Research Departments. Price $2.00.

Company Practices In Employee Transfers And Relocation
Research Report No. 23, published by the American Management Association, 330 West 42nd St., New York City 36. Price $1.50.

Successful Sales Administration—Report Forms And Procedures
Special Report No. 2, published by the American Management Association, 330 West 42nd St., New York City 36. Price $2.50.

Research On Labor Mobility
An appraisal of Research Findings in the U. S. By Herbert S. Parnes. Published by Social Science Research Council, 230 Park Ave., New York City 17. Price $1.75.

Leadership And Executive Development
A bibliography. Published by the Industrial Relations Center, University of Minnesota, Minn.

Bases For Industrial Relations
By Waldo E. Fisher. Published by the Industrial Relations Section, California Institute of Technology, Pasadena, Calif. Price $1.50.

Business Budgeting And Control
By J. Brooks Heckert, C.P.A., Professor of Accounting, Ohio State University, and James D. Willson, C.P.A., Treasurer of Affiliated Gas Equipment, Inc. Published by Ronald Press, 15 E. 26th St., New York City 10. Price $6.75.

Principles Of Management
Analysis of Managerial Functions by Harold Koontz and Cyril O'Donnell of the School of Business Administration, University of California, Los Angeles. Published by McGraw-Hill, 330 W. 42nd St., New York City 36. Price $6.50.

Fundamentals Of Professional Management
By John G. Glover, M.C.S., Ph. D., Professor of Management, School of Commerce, New York University. Published by Republic Book Company, New York City. $6.00.

Management Of Expanding Enterprises
Report of Round Table Discussions by Leading Business and Professional Men. Published by Columbia University Press, 2960 Broadway, New York City 27. Price $2.75.

Labor-Management Relations In Illini City—Volumes 1 and 2
Vol. 1—The Case Studies
Vol. 2—Explorations in Comparative Analysis. Published by the University of Illinois, 704 South 6th St., Champaign, Ill. Price $15.00 for the 2 volumes. Vol. 1 alone—$10.00; Vol. 2 alone—$7.50.

Policy Formulation And Administration
Revised Edition—1955. By George Albert Smith, Jr., A.B., D.C.S., and C. Roland Christensen, A.B., and D.C.S., Professors of Business Administration at Harvard University. Published by Richard D. Irwin, Inc., Homewood, Ill.

Chapter News . . .

Remarks By Thomas B. McCabe On Accepting The Philadelphia Chapter Annual Award

YOU very graciously asked me to comment on some of the fundamental attributes of business leadership as I have observed them in others. My comments may seem old fashioned to the moderns among you, but there are certain basic qualities of good manners, religious faith, and respect for the common virtues that seem to be characteristic of great leaders, irrespective of the period in which they live.

Certainly one fundamental attribute is vision; for without vision a business would soon perish. Vision to grasp the significance of the future and to plan for it. Most of the successful executives I have known have been great dreamers with a consuming desire to make their dreams come true. The motivating spirit of their lives has been their dreams and their indomitable faith. The spirit of such men has permeated their organizations, and their dreams have literally come true.

Furthermore, the most successful executives have a keen competitive sense with an intuitive feel of *timing*. Like a fine athletic coach, they know the strength and weaknesses of their key personnel and do not underestimate their opposition. Their zest for the game has prepared them for every eventuality, and they possess what appears to be an uncanny sense of knowing the psychological time to introduce new policies and new products. They know when to extend their operations. They also know the right circumstances for inserting and withdrawing key personnel. A very high premium is paid for managers with this rare attribute of timing.

As ever-increasing emphasis has been on science, management has come to depend more and more upon men with special skills and training. In my opinion, few men can achieve their full potential as leaders without professional competence, but such competence never has been, and never will be, a substitute for sound judgment.

We have developed many tools to help the scientific manager exercise valid, professional judgment. Nevertheless, we have found that the truly great leader possesses a spiritual quality, and a depth and breadth of mind, which enables him to reach sound conclusions based on an *understanding of the humanities* as well as scientific facts. In the last analysis, business is human relationships, and successful managements are imbued with the concept of *serving* people—with a definite recognition of responsibilities to employees, to shareholders, and to customers.

More and more we hear the expression "industrial statesmanship". In this expression we mean business leadership by men who are not only successful in advancing the interests of their own companies, but also sensitive to the civic, educational and economic problems around them, and who freely give of their experience and talents to their communities and to their government.

Tomorrow's leader, to an even greater extent than the leader of today, must have the *team approach*. As our technology has become more complex and scientists have assumed greater responsibilities in management, we have, of necessity, developed the consultative or cooperative technique in business relationships. In this technique, action and decision reflect the facts gathered by a group of experts—each making a contribution on the basis of his special field of learning. Considering the nature of our industrial operations, certainly management, for the foreseeable future, will be primarily a cooperative effort.

Undoubtedly there are great gains in industrial team work and in the unification of varied, scientific and professional talents, but the question is being asked constantly: "Have those gains been accomplished at the sacrifice of the powerful initiative, courage, and drive

of the industrial pioneers, of whom Henry Ford was such a conspicuous example?" Today, we speak more of companies than we do of individual leaders. As companies have grown and stock ownership has widened, the individualism of the proprietor concept has gradually given way to the team play of professional managers. Today our major problem is how we can retain and nourish the virtues of the individualist and the pioneer as we embrace scientific management.

Much can be done by education to develop the needed *creative capacities* of our potential leaders. Recognizing the power of education, some companies have even sponsored special programs of cultural study for promising employees, and many more encourage their participation with executives of other companies in classes of advanced management—all with the ultimate goal of helping them become all-around personalities who think *independently courageously* and *creatively*.

One of the chief concerns of management is the *objective evaluation* of its people, since that is a most effective method of discovering potential leaders and developing them for eventual executive responsibility. In our company, we devote more time to the analysis and rating of the capabilities of our young men and women than to practically any other phase of personnel or industrial relations.

We sincerely believe our program enables us, not only to recognize unusual accomplishment, but also to give the intelligent encouragement and guidance which every individual needs. We tell our managers that, when they review his strength with a man, and then discuss his weaknesses with him, sympathetically and constructively, they are fulfilling one of the most important responsibilities of an executive.

I tell you this because I am sure your top management is watching each of you as constantly and carefully as we do our managers, and that you are being evaluated on your ability to evaluate others, as well as on your ability to discover *and* develop the latent potentials of your people. It has been my experience that managers are more apt to fail in evaluation and training of their personnel than in any other phase of their activities.

One last and very important quality I have observed is present in every great manager. He has *pride* in his organization and *confidence* in his people, and he can never be satisfied with second best performance. I sometimes wonder if pride of accomplishment is not the spark that ignites a man's drive and makes him strike out each day in search of new opportunities and challenges.

I have given you what I believe to be the primary ingredients for compounding successful leadership.

Certainly they reveal no sure-fire or perfect formula. Admittedly, they are a mixture of inconsistent, and to some extent, conflicting elements. I offer them to you in the confident hope you may reconcile them to meet your individual requirements. To the degree that you are able to blend the various elements effectively, and employ the spiritual forces within you to motivate people, *so will you become one of tomorrow's leaders* in establishing an American economy of impregnable strength, and in attaining ever higher standards of living and culture for our people.

Whenever I think of leadership, I am always reminded of the words of President Wilson as he spoke to us as undergraduates in college: "Remember as you walk these classic places, you are here to enrich the world, and you impoverish yourself if you forget the errand". END

THOMAS B. McCABE, president of the Scott Paper Company, received the first Annual Award of the SAM Philadelphia Chapter, given to an individual selected from the Greater Philadelphia area, for outstanding contributions to the art and science of management. Mr. McCabe is a director of General Electric, a member of the Board of Managers of Swathmore College, a trustee of the Committee for Economic Development. He was formerly chairman of the Board of Governors of the Federal Reserve System and director of the Federal Reserve Bank of Philadelphia. The award was presented by Thomas E. Kelly, Past President of SAM Philadelphia Chapter, on February 11, 1955. (From left to right: Mr. McCabe; Mr. Kelly.)

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